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TM 11-214-15

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

RADIO TEST SET AN/URM-94

HEADQUARTERS, DEPARTMENT OF THE ARMY
JANUARY 1958

WARNING

Be careful when working on 115-volt ac line connections. Serious injury or death may result from contact with these terminals.

TECHNICAL MANUAL
No. 11-214-15

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *23 January 1958*

RADIO TEST SET AN/URM-94

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CHAPTER 1
INTRODUCTION

Section I. GENERAL

1. Scope

a. Instructions in this technical manual cover installation, operation, and maintenance of Radio Test Set AN/URM–94 (fig. 1).

b. Forward comments on this publication directly to Commanding Officer, U. S. Army Signal Publications Agency, Fort Monmouth, N. J.

2. Forms and Records

a. Unsatisfactory Equipment Reports. Fill out and forward DA Form 468 (Unsatisfactory Equipment Report), to Commanding Officer, U. S. Army Signal Equipment Support Agency, Fort Monmouth, N. J., as prescribed in AR 700–38.

b. Damaged or Improper Shipment. Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment), as prescribed in AR 700–58.

c. Preventive Maintenance Form. Prepare DA Form 11–266 (Maintenance Check List for Signal Equipment) (Test Equipment) (figs. 5, 6, and 7), in accordance with instructions on the form.

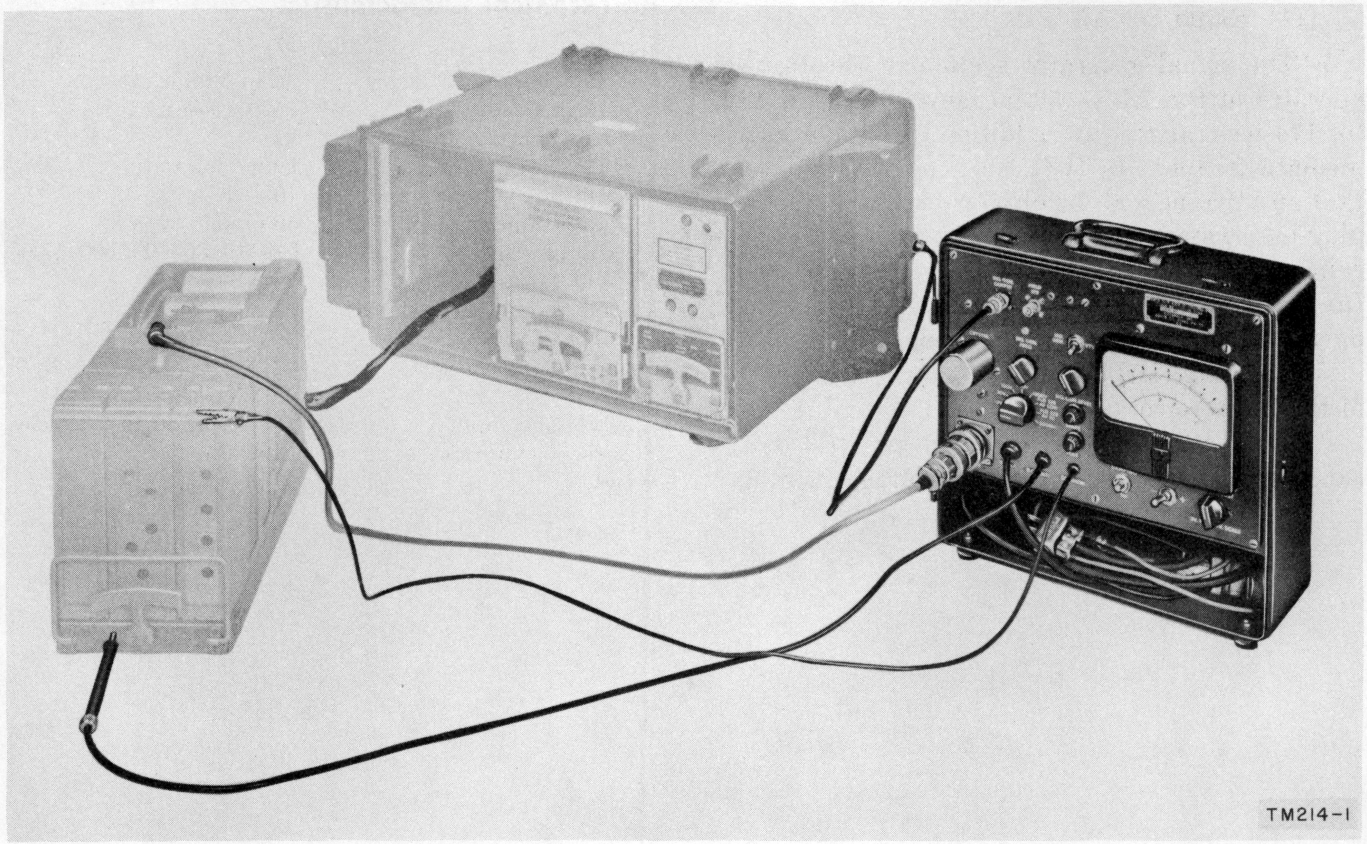

Figure 1. Radio Test Set AN/URM–94.

Section II. DESCRIPTION AND DATA

3. Purpose and Use

a. Radio Test Set AN/URM–94 consists of Radio Test Set TS–970/U and associated antenna, cables and tools as shown in figure 2. It is a portable test instrument that functions as a signal generator, vacuum-tube voltmeter, ammeter, field strength meter, crystal activity checker, or an audio-level indicator. The radiofrequency (RF) voltages developed by the signal generator section are unmodulated continuous wave. The voltammeter section is capable of direct current (dc) voltage and current measurements. The radio test set can be used for testing the nontactical radio sets listed below.

(1) Radio Sets AN/VRC–6, –6X, and –6Y.
(2) Radio Sets AN/VRC–19, –19X, and –19Y.
(3) Radio Set AN/FRC–15.
(4) Radio Set AN/TRC–22.
(5) Radio Set AN/TRC–34.
(6) Radio Set AN/FRC–27.
(7) Radio Set AN/TRC–28.
(8) Radio Receiving Set AN/FRR–44.
(9) Radio Receiving Set AN/FRR–36.
(10) Radio Set AN/TRC–33.
(11) Radio Set AN/PRC–21.

b. The signal generator section of the test set operates in the 25- to 50-megacycle (mc) or 152- to 174-mc range. In addition, common intermediate frequencies (IF), such as 455 kilocycles (kc) and 2.5 mc, can be obtained when the proper plug-in crystals are used. The output level is continuously variable from 0 to 100 microvolts (uv). A crystal in an oven unit is necessary for operation of the signal generator section. The desired crystal is borrowed from the transmitter of the radio set undergoing test.

c. The voltammeter section of the test set is capable of measuring either dc voltage in ranges up to the 0- to 1,000-volt range or direct current in the 0- to 500-milliampere (ma) range. The voltmeter is designed with a high impedance to reduce loading on the circuit under test.

d. The field-strength meter section of the test set is used to determine the relative power output from the transmitter undergoing test. It is used when tuning transmitters.

e. The crystal-activity checker section of the test set provides an indication of crystal activity. The crystal under test is compared with a crystal of known quality as to relative output level.

f. The audio-level indicator section of the test set provides a relative indication of audio or noise levels in the receiver undergoing test.

g. An alinement instruction book, attached to the inside cover of the test set, gives detailed alinement instructions for Radio Transmitters T–208/U, T–417/GR, T–278/U and T–416/GR, Radio Receivers R–257/U and R–394/U, and Radio Receiver-Transmitter RT–209/PRC. These are the basic components of the nontactical radio sets (*a* above).

4. Technical Characteristics

RF range:	
Low band	25 to 50 mc.
High band	152 to 174 mc.
Signal generator output:	
RF	Unmodulated.
Output voltage	100 uv.
Impedance	50 ohms.
Dc voltage ranges	0–3–10–30–100–300–1,000.
Current range	0 to 500 ma.
Voltmeter input impedance	11 megohms.
Number of tubes	2.
Type crystals checked	CR–18/U, –19/U, –23/U, –27/U, –28/U, –32/U.
Line voltage input	115 volts, 50 to 65 cycles.
Power consumption	15 watts.
Weight	15 pounds.

5. Components of Radio Test Set

a. Components (fig. 2).

Quantity	Item	Height (in.)	Depth (in.)	Width (in.)	Unit weight (lb)
1	Radio Test Set TS–970/U	12	6⅝	12⅜	12
1	Antenna AT–807/URM–94	12⅝ (closed) 30 (extended)			.1
1	Branched Electrical Special Purpose Cable Assembly CX–4336/URM–94.	61½			.6
1	Electrical Special Purpose Cable Assembly CX–4337/URM–94.	61½			.7
1	Cord CG–409C/U	51			.2
1	Bristo wrench				
1	Set of 2 alinement tools	5⅝			
1	Canvas bag	13⅛	7¼	13	1
1	Alinement instruction booklet	7	⅛	6⅛	
2	Technical Manual 11–214	11	⅜	8½	.2
1 set	Running spares (*b* below)				

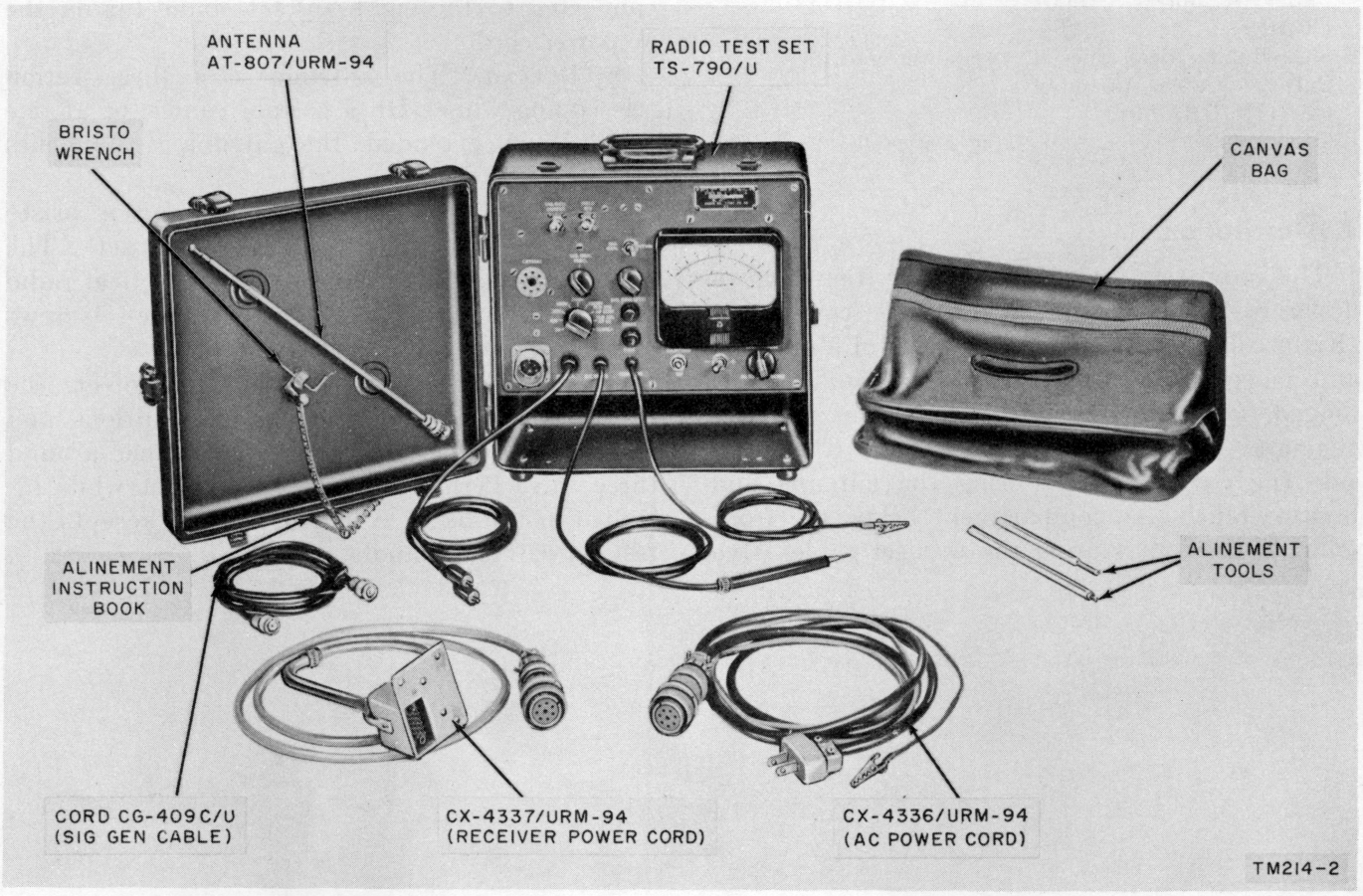

Figure 2. Radio Test Set AN/URM–94, components.

b. Running Spares. The running spares are listed in the chart below and are packed in the compartment of the test set.

Quantity	Item
1	Electron tube, 12AU7.
1	Electron tube, 6AK6.
6	Fuses F1, .005 ampere, 250V, 8AG.

6. Nomenclature and Common Name

Nomenclature and common names of components of Radio Test Set AN/URM–94 follow:

Nomenclature	Common name
Radio Test Set AN/URM–94	Radio test set.
Radio Test Set TS–970/U	Test set.
Antenna AT–807/URM–94	Antenna.
Electrical Special Purpose Cable Assembly CX–4337/URM–94.	Receiver power cord.
Branched Electrical Special Purpose Cable Assembly CX–4336/URM–94.	Ac power cord.
Cord CG–409C/U	Sig gen cable.

7. Description

The radio test set consists of the items shown in figure 2. The case of the major component (Radio Test Set TS–970/U) is made of aluminum and is equipped with a carrying handle. The hinged front panel cover is secured by five luggage-type catches and is removable. Clasps inside the cover enable storing the antenna and bristo wrench. A compartment below the front panel is used for storing the test set cables, two alinement tools and spare parts. Three of the six cables are captive-type and enter through the front panel. The COMMON cable is terminated with an alligator clip; the D. C. VOLTS cable is terminated with a test prod; and the D. C. M. A. cable is terminated in a two-connector plug.

8. Description of Minor Components (fig. 2)

a. Cables. Three separate cables are furnished with the test set. The signal generator cable is a coaxial cable with male connectors at each end. The receiver power cord is a multiconductor cable consisting of an 8-contact female connector at one end and a handle-type 14-contact male plug assembly at the opposite end. The ac power cord is similar to the receiver power cord except that an ac plug is attached at one end instead of the handle-type plug assembly. In addition, a separate lead, with an alligator clip attached, is connected to the eight-contact connector on the ac power cord.

b. Antenna. The antenna is a three-section telescoping whip with a coaxial connector at one end. When extended, the antenna is 30 inches long.

c. Tools. Two alinement tools and a bristo wrench are furnished with the test set. The alinement tools are used on the nontactical radio sets. The bristo wrench is used on the setscrews of the test set knobs.

d. Canvas Bag. The canvas bag protects the test set against minor moisture conditions and nicks or scratches. The zipper fastener around three sides permits use of the test set while installed in the bag. A slot in the top accepts the test set carrying handle.

CHAPTER 2
OPERATION

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

9. Unpacking

a. Packaging Data. An exploded view of the method of packaging is shown in figure 3. Three radio test sets are packed into one shipping carton. The three boxes and packing materials are assembled as shown and the boxes are referred to as inner carton, outer carton, and shipping carton. Packaging data is given in the chart below. Use the procedure given after the chart for unpacking the radio test set.

Box No.	Size (in.)	Volume (cu. ft.)	Unit weight (lb)	Contents
1 of 1	31 x 16 x 16	4. 6	75	Three radio test sets in individual cartons.

b. Removing Contents. Perform all the steps outlined below when unpacking.

(1) Open the flaps on the shipping carton.
(2) Remove the envelopes that contain the technical manuals.
(3) Remove the outer carton wrapped in a waterproof barrier. Remove the carton from the barrier.
(4) Open the flaps on the outer carton. Remove the inner carton, wrapped in the moisture-vaporproof barrier. Open the barrier by slitting along its seal. Then remove the inner carton.
(5) Open the flaps on the inner carton, remove the top filler, desiccant bags, and wrap-around filler and then the test set.

10. Checking Unpacked Equipment

a. Check the equipment against the list of components (par. 5). The minor components are located in a compartment under the test set cover.

b. Unlatch the test set cover and inspect for damage incurred in shipment. Check for dented cabinet, loose knobs, broken meter glass, etc. Remove the six screws around the edges of the front panel and carefully remove the front panel assembly. Check for broken or loose tubes, and for damaged small component parts. If the equipment has been damaged, refer to paragraph 2. Check to see that the fuse installed is type 8AG, .005 ampere, 250V. An identical spare fuse is located in the SPARE fuse holder.

11. Connections

Connections of the test set to the radio set under test, as required for operation, are given in the alinement instruction booklet supplied with the test set. Connections other than those described are not required. No initial adjustments are required before operation of the test set.

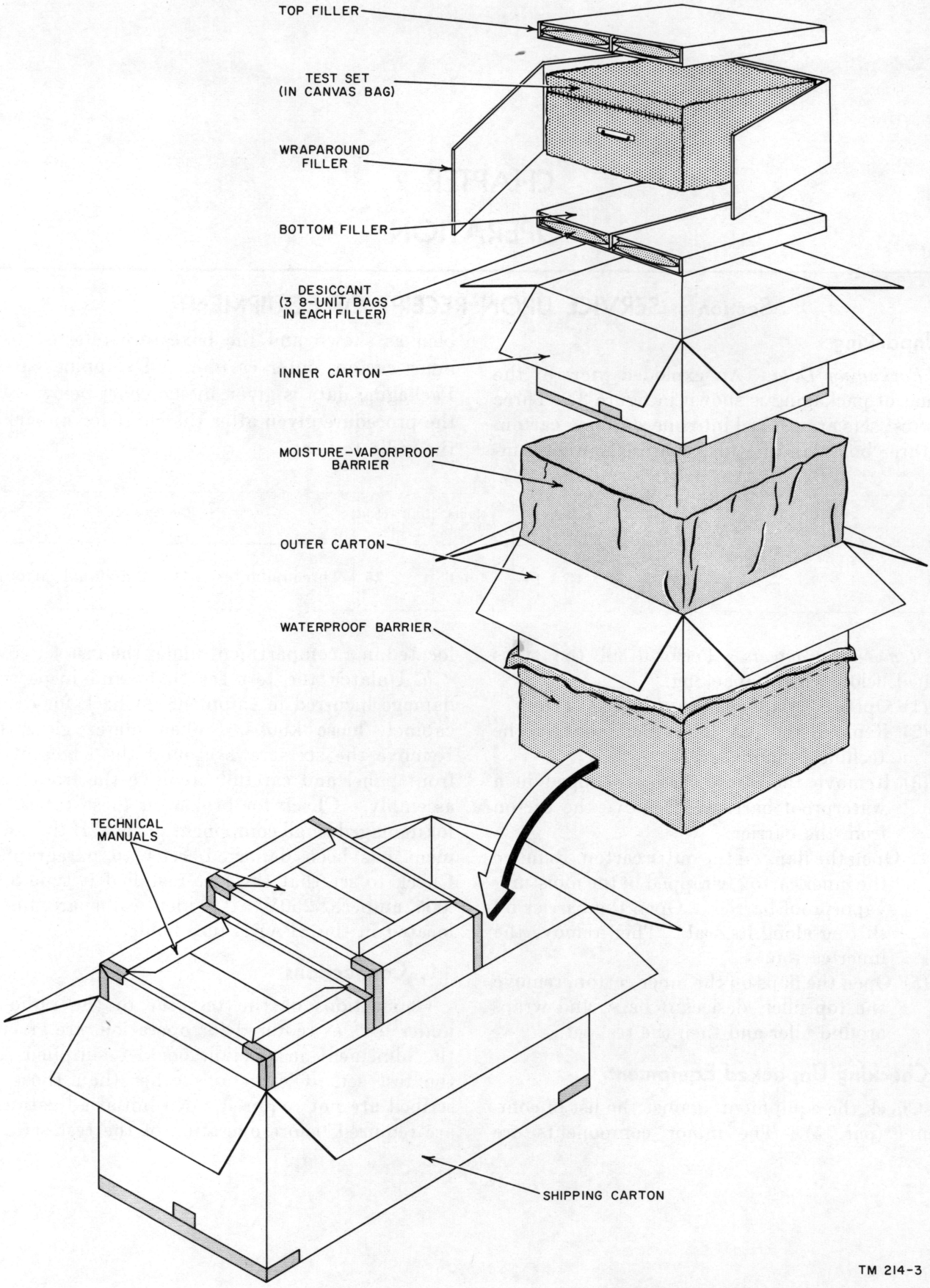

Figure 3. Radio test set, typical packaging.

Section II. OPERATING INSTRUCTIONS

12. Operating Controls
(fig. 4)

Improper connections or settings can cause damage to the test set or incorrect meter readings. Become familiar with all controls and their functions before operating. The operating controls and indicators are listed, and their functions stated, in the following table:

Control or indicator	Function
Meter	Primary indicator for all measurements made with the test set.
VTVM-SIG. GEN. switch.	In VTVM position, enables making dc voltage measurements.
	In SIG. GEN. position, enables meter measurement of signal generator output level.
Meter switch	Selects function of test set to be used. Switch positions are as follows:
	Position — *Function*
	Note. For use of the following voltage range positions, the VTVM SIG. GEN. switch must be in VTVM position.
	3V — Permits dc voltage measurement up to 3 volts.
	10V — Permits dc voltage measurement up to 10 volts.
	30V — Permits dc voltage measurement up to 30 volts.
	100V — Permits dc voltage measurement up to 100 volts.
	300V — Permits dc voltage measurement up to 300 volts.
	1000V — Permits dc voltage measurement up to 1000 volts.
	FLD STR AF LOW. — Permits measurement of low level transmitted or audio signals.
	FLD STR AF HI. — Permits measurement of high level transmitted or audio signals.
	500 MA — Permits direct current measurement up to 500 ma.
−+polarity switch.	Reverses meter polarity for measurement of positive or negative voltages or current. For FLD STR AF LOW or FLD STR AF HI position, place switch in + position.
ZERO ADJUST control.	Allows setting the meter needle on zero mark for 3V, 10V, 30V, 100V, and 300V positions of meter switch.
SIG. GEN. LEVEL control.	Varies RF output level of test set; VTVM-SIG. GEN. switch must be in SIG. GEN. position for metering output level.
SIG. GEN. FREQ. control.	Varies frequency of signal generator output .5 to 16 kilocycles (range increases with order of output harmonic).
DAMPING SW.	Shorts meter to retard needle wobble when the test set cover is in place and test set is not being used.

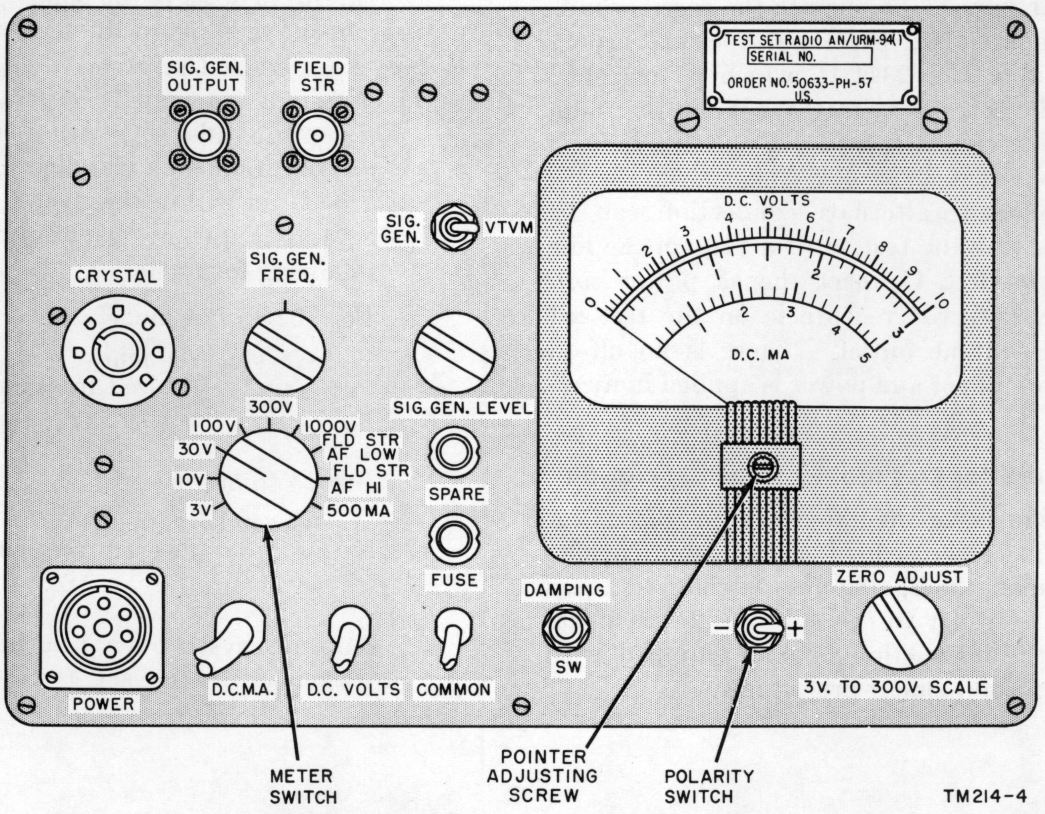

Figure 4. Operating controls and indicator.

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13. Types of Operation

a. Radio Test Set AN/URM–94 may be operated as a voltammeter, signal generator, crystal activity checker, field-strength meter, or audio-level indicator.

b. For any type of operation, except field-strength or current measurements, perform the following procedures. When making field-strength or current measurements, perform only the step in (2) below.

(1) Starting procedure (par. 14).
(2) Specific procedure for desired type of operation (par. 15).
(3) Stopping procedure (par. 16).

14. Starting Procedure

To start the test, set, make the connection described in either *a* or *b* below. Allow a 1-minute warmup for voltammeter operation or crystal-activity checking and a 5-minute warmup for signal generator operation.

a. For radio sets that contain Radio Receivers R–257/U or R–394/U, connect the receiver power cord between the POWER receptacle on the test set and jack J263 in the Receiver Assembly MX–1547/G cell of the receiver. The receiver must be removed from its compartment in the radio set to make the connection to J263. Enough cable clearance is available then to replace the receiver in its compartment. To operate the receiver outside the compartment, Electrical Special Purpose Cable Assembly CX–2371/U, which is furnished with the radio set, may be used. When the radio set undergoing test is turned on, the test set will also be turned on.

b. The following alternate connection can be made for starting the test set if a 115-volt ac line source is available: Connect the ac power cord between the POWER receptacle on the test set and the 115-volt ac outlet. There is no off-on switch on the test set and power is applied immediately.

15. Procedure for Desired Type of Operation

The procedures for the different types of test set operation are described in *a* through *e* below. The equipment undergoing test is referred to as the radio set. Refer to the appropriate technical manual or the instruction booklet supplied with the test set for alinement procedures.

a. Voltammeter Operation.

(1) Connect the alligator clip of the COMMON cable on the test set to the chassis of the radio set. Use the pointer adjusting screw (fig. 4) to set the needle at zero. Proceed directly to the steps in (7) and (8) below if measuring direct current.
(2) Set the meter switch to the proper voltage range for the highest expected voltage measurement.
(3) Set the VTVM-SIG. GEN. switch to the VTVM position.
(4) Set the polarity switch for polarity of the expected measurement.
(5) If the meter switch is set on the 3V, 10V, 30V, 100V, or 300V position, connect the D. C. VOLTS probe to the chassis and set the ZERO ADJUST control so that the meter reads zero.
(6) With the meter switch on the proper voltage range, connect the probe of the D. C. VOLTS cable on the test set to the desired test point on the radio set and read the voltage reading on the meter.
(7) To measure current, set the meter switch to the 500MA position.
(8) Connect the plug of the D. C. M. A. cable on the test set to the proper (plate current) test jacks on the radio set. Be careful to observe the polarity. Read the current reading on the meter.

b. Signal Generator Operation.

(1) Obtain a transmitter crystal oven unit (from the radio set) with a crystal of the desired frequency installed in the crystal 1 position within the oven. The correct crystal frequency is determined by the following formulae:

For 152 to 174 mc:

$$\text{Crystal frequency (mc)} = \frac{\text{desired frequency}}{32}$$

For 25 to 50 mc:

$$\text{Crystal frequency (mc)} = \frac{\text{desired frequency}}{16}$$

(2) Plug the crystal oven into the CRYSTAL socket on the test set.

(3) Connect the sig gen cable from the SIG. GEN. OUTPUT jack on the test set to the antenna connector on the radio set.

(4) Set the VTVM-SIG. GEN. switch to the SIG. GEN. position.

(5) Turn the SIG. GEN. LEVEL control clockwise to obtain a reading on meter. Set the control to the desired level.

(6) Adjust the SIG. GEN. FREQ. control to produce receiver discriminator voltage (read at DISCR test point) equal to the discriminator idling voltage read without signal input (see alinement instruction booklet).

c. Crystal-Activity Checker Operation.

(1) Obtain a transmitter crystal oven and insert the crystal to be checked into the crystal 1 position within the oven.

(2) Plug the crystal oven into the CRYSTAL socket on the test set.

(3) Turn the SIG. GEN. LEVEL control clockwise to observe a reading on the meter. Compare the meter reading with that of a normal crystal of approximately the same frequency.

d. Field-Strength Meter Operation.

(1) Place the test set at least 10 feet from the transmitter antenna of the radio set.

(2) Connect the test set antenna to the FIELD STR jack. Extend the antenna to full length.

(3) Set the meter switch to the FLD STR AF HI or FLD STR AF LOW position, as necessary, while observing meter level.

e. Audio-Level Indicator Operation. If the radio set being tested is part of a base station, the audio level may be read on the meter while performing the step in (1) below. When using the receiver power cord, make a jumper connection between terminals 9, 10, and 11 of TB251 in the receiver (Radio Receiver R–297/U or R–394/U). When using the ac power cord, the above jumper connections are unnecessary; connect the alligator clip to terminal 10 on TB251.

(1) Set the meter switch to the FLD STR AF HI or FLD STR AF LOW position, as necessary, while observing meter level.

(2) When this test is completed, remove any jumper connections which were made for this test.

16. Stopping Procedure

a. To stop the test set, disconnect the ac power cord or receiver power cord (whichever is being used).

b. Pack all cables into the compartment and latch the test set cover.

CHAPTER 3
ORGANIZATIONAL MAINTENANCE

Section I. PREVENTIVE MAINTENANCE

17. Tools, Materials, and Test Equipment Required

The tools and test equipment necessary to perform organizational maintenance are authorized by appropriate publications. The following tools and test equipments are required for organizational maintenance. The alinement tools supplied with the test set are used on the radio equipment under test. The bristo wrench is used on the setscrews of the test set knobs.

a. Tools.

(1) Tool Equipment TE–41.
(2) Seven-pin and nine-pin tube pullers.
(3) Bristo wrench.

b. Materials.

(1) Cleaning Compound (Federal stock No. 7930–395–9542).
(2) Cleaning cloth.
(3) Fine sandpaper.

c. Test Equipment.

(1) Multimeter ME–77/U.
(2) Electron Tube Test Set TV–7/U.

18. General Preventive Maintenance Techniques

a. Use No. 000 sandpaper to remove corrosion.

b. Use a clean, dry, lint-free cloth or a dry brush for cleaning. If necessary, wipe any parts including electrical contacts with a cloth moistened with cleaning compound; then wipe the parts dry with a cloth.

Caution: Cleaning compound is flammable and its fumes are toxic. Do not use near a flame; provide adequate ventilation.

19. Use of Preventive Maintenance Form

DA Form 11–266 (figs. 5, 6, and 7) is a preventive maintenance checklist to be used by the operator and unit repairman. Items not applicable to the test set are lined out in the figures. References in the ITEM blocks in the figures are to paragraphs which contain additional maintenance information about the particular item. Instructions for use appear on the form (fig. 5).

a. First Echelon Items (fig. 6).

Item No.	Maintenance procedures
1	Use a clean cloth to remove dust, dirt, moisture, and grease from the antenna, jacks, and front panel controls.
3	All control knobs should work smoothly, be tight on the shafts, and should not bind. Tighten all loose knobs; be sure those with pointer marks are properly alined. Be sure that the knobs do not rub against the panel.
5	Inspect the cables for cuts, breaks, fraying, deterioration, kinks, and strain. Check at junctions where captive cables enter the front panel.
7	Check the hinges and latches on the cover of the case for proper operation and check the rubber gasket on the case for cracks or poor sealing.
10	Remove all rust from components and touch up bare spots with paint.

b. Second and Third Echelon Items (fig. 7).

Item No.	Maintenance procedure
17	Inspect variable capacitor (SIG. GEN. FREQ. control) for dirt, moisture, misalinement of plates, and loose mounting.

MAINTENANCE CHECK LIST FOR SIGNAL EQUIPMENT
TEST EQUIPMENT
(AR 750-625)

EQUIPMENT NOMENCLATURE

RADIO TEST SET AN/URM-94

EQUIPMENT SERIAL NUMBER

37

INSTRUCTIONS

This form may be used for a period of one month by using the correct dates and weeks of the month. It is to be used as a Preventive Maintenance check list for Signal equipment in actual use, or for a check on equipment prior to issue.

1. For detailed Preventive Maintenance instructions see:
   a. The Technical Manual *(in TM 11 series)* for the equipment. *(See DA Pamphlet Number 310-4)*
   b. The Supply Bulletin *(SB 11-100 series)* for the equipment. *(See DA Pamphlet Number 310-4)*
   c. The Department of the Army Lubrication Order. *(See DA Pamphlet Number 310-4)*

2. The following action will be taken by either the Communications Officer/ Chief for 1st echelon, or the Inspector for higher echelon:
   a. Enter Equipment Nomenclature and Serial Number.
   b. Strike out items that do not apply to the equipment.

3. Operator/Inspector will enter in the columns entitled CONDITION, on the proper line, a notation regarding the condition, using symbols specified under LEGEND.

4. After operator completes each daily inspection he will initial over the appropriate dates under "Daily Condition for Month", then return form to his supervisor.

FOLD

TYPE OF INSPECTION

OPER-ATOR	2/3 ECH-ELON	DATE	SIGNATURE
✓		4 DEC	M/SGT ROY BARRIE
✓		11 DEC	M/SGT Ray O'Neill

U. S. GOVERNMENT PRINTING OFFICE 1957 O—427138

4

DA FORM 1 MAY 57 11-266

TM 214-5 (1)

Figure 5. DA Form 11–266, as used by operator.

LEGEND for marking conditions:
Satisfactory, ✓.
Adjustment, Repair or Replacement required, X.
Defect corrected, (X).

DAILY CONDITION FOR MONTH OF

NO.	DAILY ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	2D 3D ECHELON
		RB	RB	RB	RB	RB	OD	OD	RB	RB	RB	RB	RB	OD	OD			
		17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
1.	CLEAN DIRT AND MOISTURE FROM EXPOSED SURFACES OF ~~HOUSINGS~~, CASES, ~~CABINETS~~, CONTROL PANELS, ~~INTER-CONNECTING PLUGS~~, CABLES, ~~HEADSETS~~, METER WINDOWS, ETC. PAR. 19a	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
2.	INSPECT FOR LOOSENESS OF EXTERIOR ITEMS SUCH AS SWITCHES, KNOBS, ~~JACKS~~, CONNECTORS, ~~AND PILOT LIGHTS~~.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
3.	INSPECT CONTROLS FOR BINDING, SCRAPING. ~~TID CONTROLS LIGHTLY FOR CUT-OUT DUE TO LOOSE CONTACTS~~. PAR. 19a	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
4.	DURING OPERATION BE ALERT FOR ANY UNUSUAL PERFORMANCE OR CONDITION. PAR. 15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			

WEEKLY	CONDITION EACH WEEK 1ST	2D	3D	4TH	5TH	2D 3D ECH
5. INSPECT CORDS, CABLES, ~~WIRE AND SHOCK MOUNTS~~ FOR BREAKS, CUTS, KINKS, DETERIORATION, STRAIN AND FRAYING. PAR. 19a	RB	RB				
6. INSPECT CANVAS ~~AND LEATHER ITEMS~~ FOR FUNGUS, FRAYING, TEARS. BROKEN ZIPPERS AND SNAP FASTENERS.	RB	RB				
7. HAND CHECK FOR LOOSENESS OF EXTERIOR ITEMS SUCH AS HANDLES, LATCHES, HINGES. PAR. 19a	RB	RB				
8. ~~INSPECT FOR LUBRICATION IN ACCORDANCE WITH APPLICABLE OI LUBRICATION ORDER~~.						
9. ~~INSPECT DRY BATTERIES FOR DIRT, LOOSE TERMINALS AND LEAKAGE~~.						
10. INSPECT EXPOSED METAL SURFACES FOR RUST AND CORROSION. PAR. 19a	RB	RB				
11. INSPECT METER~~S~~ FOR DAMAGED GLASS ~~AND CASES~~.	RB	RB				

ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS	CONDITION
12. INSPECT SEATING OF READILY ACCESSIBLE ITEMS OF A PLUG-OUT NATURE; CRYSTALS, FUSES, CONNECTORS, PLUG-IN COILS, LAMPS, ETC. DO NOT REMOVE, ROCK OR TWIST TO INSPECT. USE ONLY A DIRECT PRESSURE TO INSURE THE ITEM IS FULLY SEATED.	
13. ~~INSPECT FOR CLEANLINESS AND TIGHTNESS OF SUCH ITEMS AS SHOCK MOUNTS, ANTENNA, ANTENNA MOUNTS AND WAVE GUIDES~~.	
14. ~~INSPECT RELAY AND CIRCUIT BREAKER ASSEMBLIES FOR DIRT, CORROSION, WORN OR BURNED CONTACTS~~.	

ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS	CONDITION
15. ~~INSPECT RESISTORS, BUSHINGS, INSULATORS FOR CRACKS, CHIPPING, BLISTERING, DISCOLORATION AND MOISTURE~~.	
16. ~~INSPECT JACKS AND CONNECTORS FOR SNUG FIT AND GOOD CONTACTS~~.	
17. ~~INSPECT VARIABLE CAPACITORS FOR DIRT AND MOISTURE~~.	
18. ~~INSPECT AIR FILTERS FOR CLEANLINESS~~.	
19. ~~INSPECT SCREW-TYPE TERMINALS OF TRANSFORMERS, FIXED CAPACITORS, RESISTORS, CHOKES, POTENTIOMETERS AND RHEOSTATS FOR CORROSION, DIRT AND LOOSE CONTACTS~~.	
20. ~~CLEAN AND TIGHTEN SWITCHES, BLOWERS, RELAY CASES; CLEAN INTERIOR OF CHASSIS AND CABINETS~~.	
21. ~~INSPECT GENERATORS, MOTORS AND DYNAMOTORS FOR BRUSH WEAR, SPRING TENSION, ARCING AND COMMUTATOR WEAR~~.	
22. ~~INSPECT TERMINAL BLOCKS FOR LOOSE CONNECTIONS, CRACKS AND BREAKS~~.	
23. ~~INSPECT GASKETS AND BUSHINGS FOR WEAR AND DAMAGE~~.	
24. ~~INSPECT CATHODE RAY TUBES FOR BURNED SCREEN SPOTS~~.	
25. ~~BEFORE STORING OR SHIPPING - REMOVE ALL BATTERIES~~.	

IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING THE INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION. *(Continue on page 4, if more space is needed)*

2 3

TM 214-5 (2)

Figure 6. DA Form 11-266, as used by operator.

LEGEND for marking conditions:
Satisfactory, ✓
Adjustment, Repair or Replacement required, X.
Defect corrected, (X).

DAILY CONDITION FOR MONTH OF

NO.	DAILY ITEM	1/17	2/18	3/19	4/20	5/21	6/22	7/23	8/24	9/25	10/26	11/27	12/28	13/29	14/30	15/31	16	2D 3D ECHELON
1.	CLEAN DIRT AND MOISTURE FROM EXPOSED SURFACES OF ~~HOUSINGS~~, CASES, ~~CABINETS~~, CONTROL PANELS, ~~INTER-CONNECTING PLUGS~~, CABLES, ~~HEADSETS~~, METER WINDOWS, ETC.																	✓
2.	INSPECT FOR LOOSENESS OF EXTERIOR ITEMS SUCH AS SWITCHES, KNOBS, ~~JACKS~~, CONNECTORS, ~~AND PILOT LIGHTS~~,																	✓
3.	INSPECT CONTROLS FOR BINDING, SCRAPING. ~~TAP CONTROLS LIGHTLY FOR CUT-OUT DUE TO LOOSE CONTACTS~~.																	✓
4.	DURING OPERATION BE ALERT FOR ANY UNUSUAL PERFORMANCE OR CONDITION.																	✓

WEEKLY	CONDITION EACH WEEK 1ST	2D	3D	4TH	5TH	2D 3D ECH
5. INSPECT CORDS, CABLES, ~~WIRE AND SHOCK MOUNTS~~ FOR BREAKS, CUTS, KINKS, DETERIORATION, STRAIN AND FRAYING.				•		✓
6. INSPECT CANVAS ~~AND LEATHER ITEMS~~ FOR FUNGUS, FRAYING, TEARS. BROKEN ZIPPERS AND SNAP FASTENERS.						✓
7. HAND CHECK FOR LOOSENESS OF EXTERIOR ITEMS SUCH AS HANDLES, LATCHES, HINGES.						✓
8. ~~INSPECT FOR LUBRICATION IN ACCORDANCE WITH APPLICABLE DA LUBRICATION ORDER~~.						
9. ~~INSPECT DRY BATTERIES FOR DIRT, LOOSE TERMINALS AND LEAKAGE~~.						
10. INSPECT EXPOSED METAL SURFACES FOR RUST AND CORROSION.						✓
11. INSPECT METERS FOR DAMAGED GLASS, ~~AND CASES~~.						✓

ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS	CONDITION
12. INSPECT SEATING OF READILY ACCESSIBLE ITEMS OF A PLUCK-OUT NATURE: ~~CRYSTALS~~, FUSES, ~~CONNECTORS, PLUG-IN COILS, LAMPS~~, ETC. DO NOT REMOVE, ROCK OR TWIST TO INSPECT. USE ONLY A DIRECT PRESSURE TO INSURE THE ITEM IS FULLY SEATED.	✓
13. INSPECT FOR CLEANLINESS AND TIGHTNESS OF SUCH ITEMS AS ~~SHOCK MOUNTS~~, ANTENNA, ANTENNA MOUNTS, ~~AND WAVE GUIDES~~.	✓
14. ~~INSPECT RELAY AND CIRCUIT BREAKER ASSEMBLIES FOR DIRT, CORROSION, WORN OR BURNED CONTACTS~~.	

ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS	CONDITION
15. INSPECT RESISTORS, ~~BUSHINGS, INSULATORS~~ FOR CRACKS, CHIPPING, BLISTERING, DISCOLORATION AND MOISTURE.	✓
16. INSPECT ~~JACKS AND~~ CONNECTORS FOR SNUG FIT AND GOOD CONTACTS.	✓
17. INSPECT VARIABLE CAPACITORS FOR DIRT AND MOISTURE. PAR 19b	✓
18. ~~INSPECT AIR FILTERS FOR CLEANLINESS~~.	
19. ~~INSPECT SCREWTYPE TERMINALS OF TRANSFORMERS, FIXED CAPACITORS, RESISTORS, CHOKES, POTENTIOMETERS AND RHEOSTATS FOR CORROSION, DIRT AND LOOSE CONTACTS~~.	
20. CLEAN AND TIGHTEN SWITCHES, ~~BLOWERS, RELAY CASES~~; CLEAN INTERIOR OF CHASSIS AND CABINETS.	✓
21. ~~INSPECT GENERATORS, MOTORS AND DYNAMOTORS FOR BRUSH WEAR, SPRING TENSION, ARCING AND COMMUTATOR WEAR~~.	
22. INSPECT TERMINAL BLOCKS FOR LOOSE CONNECTIONS, CRACKS AND BREAKS.	✓
23. ~~INSPECT GASKETS AND BUSHINGS FOR WEAR AND DAMAGE~~.	
24. ~~INSPECT CATHODE RAY TUBES FOR BURNED SCREEN SPOTS~~.	
25. ~~BEFORE STORING OR SHIPPING - REMOVE ALL BATTERIES~~.	

IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING THE INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION. *(Continue on page 4, if more space is needed)*

2 3

TM 214-7

Figure 7. DA Form 11–266, as used by unit repairman.

Section II. TROUBLESHOOTING AT ORGANIZATIONAL MAINTENANCE LEVEL

20. Extent of Instructions

a. Organizational troubleshooting techniques may be applied to restore the test set to operating condition by replacing a faulty plug-in part or locating obvious troubles in cables or components.

b. The troubleshooting techniques are represented in two general procedures; the visual inspection and the use of the equipment performance checklist (pars. 21 and 22).

21. Visual Inspection

Failure of the test set may be caused by an easily overlooked mechanical or electrical fault. When the equipment fails to perform properly, turn off the power and check all the items listed below.

a. Burned-out fuse.

b. Incorrect settings of switches or controls.

c. Poor connections of power or test cables.

d. Worn or broken cords or plugs.

22. Equipment Performance Checklist

a. General. The equipment performance checklist helps the unit repairman to locate and correct troubles limited to plug-in parts. All corrective measures that the second-echelon repairman can perform are given in the *Corrective measures* column.

b. Procedure. Place the test set in operation (pars. 14 and 15); use the ac power cord. After the equipment has had time to warm up, perform the steps below in the order given. Observe the test set operation and perform any corrective measures necessary. If the corrective measures indicated do not fix the equipment, troubleshooting is required by higher echelon. Note on the repair tag how the equipment performed and the corrective measures that were taken.

	Step	Action or condition	Normal indication	Corrective measures
START	1	Connect ac power cord between POWER connector on test set and 115-volt ac outlet and set the polarity switch to the + position.		
EQUIPMENT PERFORMANCE	2	Set meter switch to 3V.		
	3	Vary ZERO ADJUST control	Meter reading varies about zero	Check tube V1 and fuse F1. Check continuity of ac power cord.
	4	Repeat step 3 with meter switch successively on 10V, 30V, 100V, and 300V positions.	Same as above	Higher echelon repair required.
	5	Plug a good crystal oven unit (with high or low band crystal installed) into CRYSTAL socket.		
	6	Set VTVM-SIG. GEN. switch to SIG. GEN. position.		
	7	Set meter switch to 30V position.		
	8	Vary SIG. GEN. LEVEL control	Meter reading varies to zero	Check tube V2.
	9	Set SIG. GEN. LEVEL control fully clockwise.		
	10	Vary SIG. GEN. FREQ. control more than 1 full turn.	Meter reading varies slightly	If reading drops to zero, SIG. GEN. FREQ. control trimmer plates may be shorted. Repair.
	11	Press DAMPING SW switch	Meter reading decreases to zero	Higher echelon repair required.
	12	Decrease meter reading slightly above zero mark with SIG. GEN. LEVEL control.		
	13	Momentarily set polarity switch to— position.	Meter reads below zero	Higher echelon repair required.
STOP	14	Disconnect ac power cord from POWER connector on test set and 115-volt ac outlet.		

23. Tube-Testing Techniques

When trouble occurs, check all cabling connections before removing any tubes. If tube failure is suspected, use the applicable procedure below to check the tubes.

Caution: Do not rock or rotate a tube when removing it from a socket; pull it straight out with a tube puller.

a. Use of Tube Tester. Remove and test one tube at a time. Discard a tube only if its defect is obvious or if the tube tester shows it to be defective. Do not discard a tube that tests at or near its minimum test limit on the tube tester. Put back the original tube, or insert a new one if required, before testing the other.

b. Tube Substitution Method. Replace a suspected tube with a new tube. Tube locations are shown in figure 17. If the equipment still does not work, remove the new tube and put back the original tube. Repeat this procedure with the other tube.

c. Replacement of Tubes.

(1) Unscrew the six screws around the edges of the front panel and carefully remove the front panel.

(2) Remove the tube shield by twisting it counterclockwise while pressing down against spring pressure.

(3) Replace the desired tube and tube shield.

(4) Refasten the front panel with the six screws.

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CHAPTER 4
THEORY

Section I. SIGNAL PATHS

24. Signal Paths in Voltammeter Operation

a. Voltmeter. When the test set is used as a voltmeter, the D. C. VOLTS probe is used to tap the voltage being measured. Common ground to the equipment is established by use of the COMMON cable.

b. Ammeter. When the test set is used to measure current, the plug on the D. C. M. A. cable is connected to a mating jack on the equipment. The COMMON cable is not needed.

25. Signal Paths in Signal Generator Operation

When the test set is used as a signal source for alining nontactical radio receivers, a crystal oven unit with a crystal of the proper fundamental frequency (par. 15*b* (1)) is taken from the transmitter portion of the nontactical radio set and plugged into the CRYSTAL jack of the test set. The test set oscillator circuit provides the signal generation. A desired harmonic frequency is obtained at the SIG. GEN. OUTPUT jack and fed to the receiver through the sig gen cable.

26. Signal Paths in Field-Strength Meter Operation

When the test set is used to measure field strength, the three-section telescoping antenna is connected to the FIELD STR jack and the test set is placed at least 10 feet from the transmitter being tested.

27. Signal Paths in Crystal-Activity Operation

When the test set is used to check for crystal activity, the particular crystal is plugged into the CRYSTAL socket and its relative activity measured on the meter.

28. Signal Paths in Audio-Level Indicator Operation

When the test set is used to measure an audio level, the audio signal is fed to the test set through a lead in the ac power cord or receiver power cord. With mobile nontactical equipment, a jumper must be placed across three terminals in the receiver to derive the audio signal. With base station nontactical equipment, this jumper is unnecessary.

Section II. UNIT THEORY

29. Block Diagram
(fig. 8)

The test set is a combination metering instrument and signal generator. Signal paths are shown in the block diagram and are discussed in *a* through *d* below. For complete circuit details, refer to the overall schematic diagram (fig. 21).

a. Metering Circuit. The metering circuit consists of meter switch S1, meter amplifier V1, and meter M1. The meter switch selects ranges for measuring different dc voltages checked with the D. C. VOLTS probe, the D. C. M. A. current-measurement probe, the antenna signal or audio signal input in combination with the VTVM-SIG. GEN. switch, or the output of oscillator V2. The meter switch feeds the dc voltages (except on the 1,000-volt range) through meter amplifier V1 to meter M1. Other measurements are fed directly to meter M1. If VTVM-SIG. GEN. switch S4 is in the VTVM position, the test set measures voltages picked up with the D. C. VOLTS probe. If switch S4 is in the SIG. GEN. position, the output of oscillator V2 is measured on the meter.

b. Meter Amplifier V1. The dc voltage being measured (on ranges less than 1,000 volts) is fed to meter amplifier V1, a dual triode bridge circuit. The meter amplifier tube enables measurements of voltages with negligible loading on the circuit being measured.

c. Oscillator V2. Oscillator V2 operates when the test set is used as a signal generator or crystal-activity checker. It is a crystal-controlled Colpitts-type oscillator. During signal generator operation, the 16th and 32d harmonics are used. VTVM-SIG. GEN. switch S4 permits the meter to monitor the signal level available at the SIG. GEN. OUTPUT jack.

d. Power Supply. The power supply is a conventional transformer type providing +150 volts and 6.3 volts ac. It is used only when the ac power cord is connected. If the receiver power cord is used and is connected to the nontactical radio set, +150 volts and 6.3 volts (ac or dc) are supplied by the radio set. (The receiver power cord cannot be used with Radio Set AN/PRC–21.)

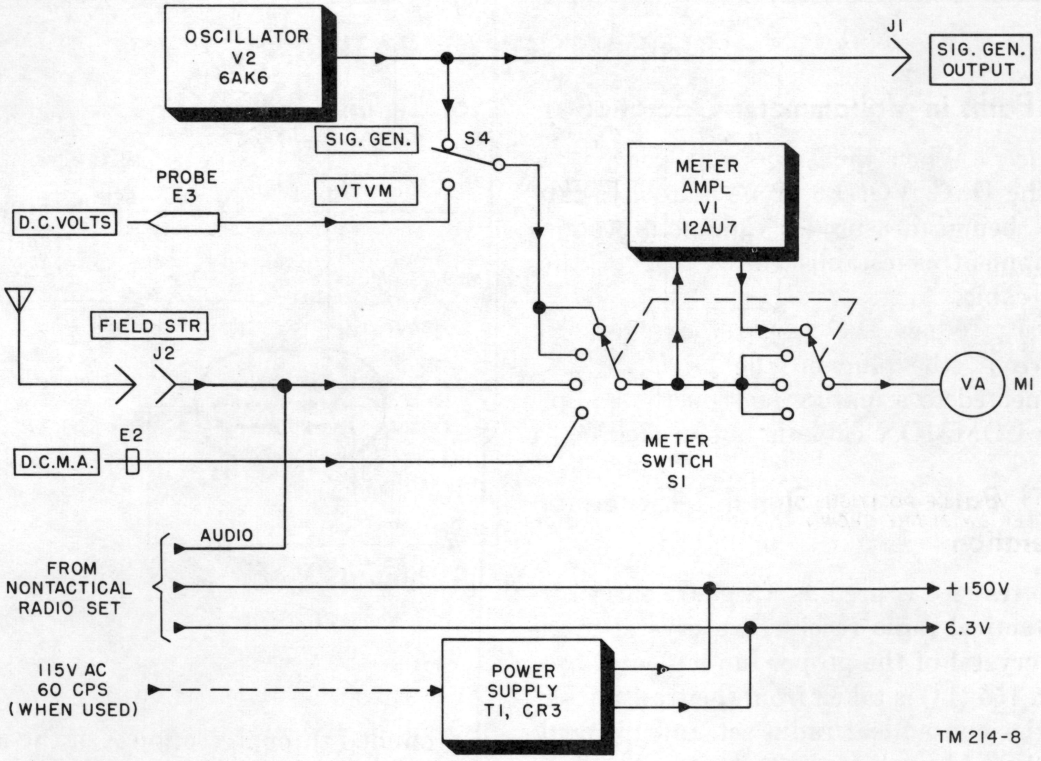


Figure 8. Block diagram.

30. Meter Switch S1

a. General. Meter switch S1 functions as a voltage range switch and test selector in conjunction with VTVM-SIG. GEN. switch S4. The meter switch consists of three sections. Sections A and B connect to the meter M1 circuit. Section C connects to the grid (pin 2) of meter amplifier V1 on all but one (1000V) of the voltage positions.

b. Voltage Measurement (fig. 9). The meter switch is a range switch for voltage measurement when the VTVM-SIG. GEN. switch is on VTVM. Voltages checked with the D. C. VOLTS probe are fed through isolating resistor R1 located in the probe. In the 3V position of the meter switch (section C), the unknown voltage is fed to grid pin 2 of meter amplifier V1A. In the 10V, 30V, 100V, and 300V positions, the unknown voltage is divided by resistors R4, R5, R6, R7, and R33, and then is fed to meter amplifier V1. In the 1000V position, the unknown voltage is dropped by the series combination of resistors R2 and R3 to within the maximum meter deflection range. Section A of the meter switch grounds the opposite side of the meter on this position. If VTVM-SIG. GEN. switch S4 is in the SIG. GEN. position, the D. C. VOLTS probe is disconnected and cannot be used. The signal output level of oscillator V2, however, can then be read on the meter by selection of the proper voltage range of the meter switch.

c. Field Strength and Audio Level Measurement (fig. 10). When the meter switch is placed in the FLD STR AF LOW or FLD STR AF HI position, section C of the switch is disconnected. Either audio or RF signal level may be measured in these two positions of the meter switch. Audio from the nontactical radio set under test is fed through connector J3, an RF filter composed of C12 and

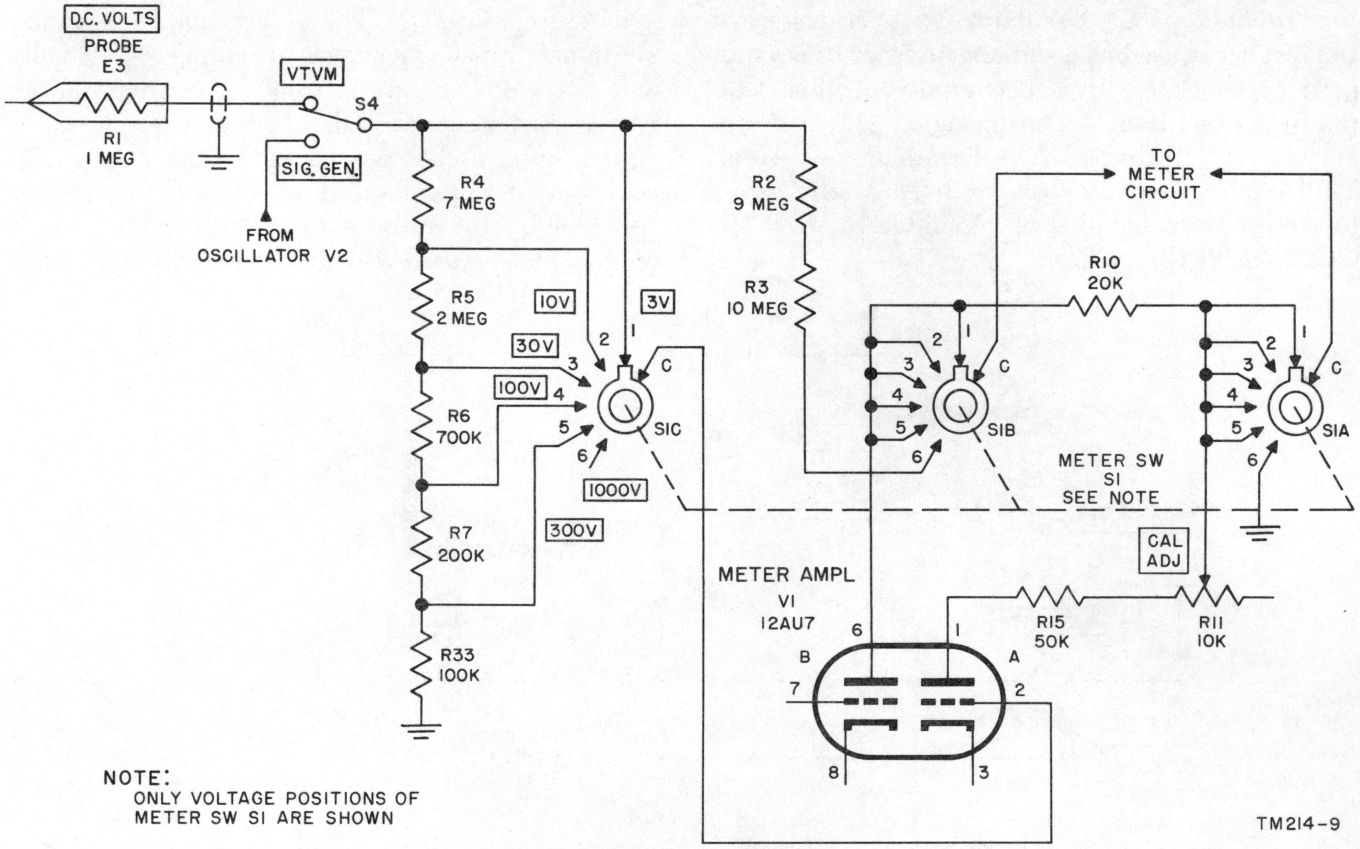


Figure 9. Voltage positions of meter switch S1.

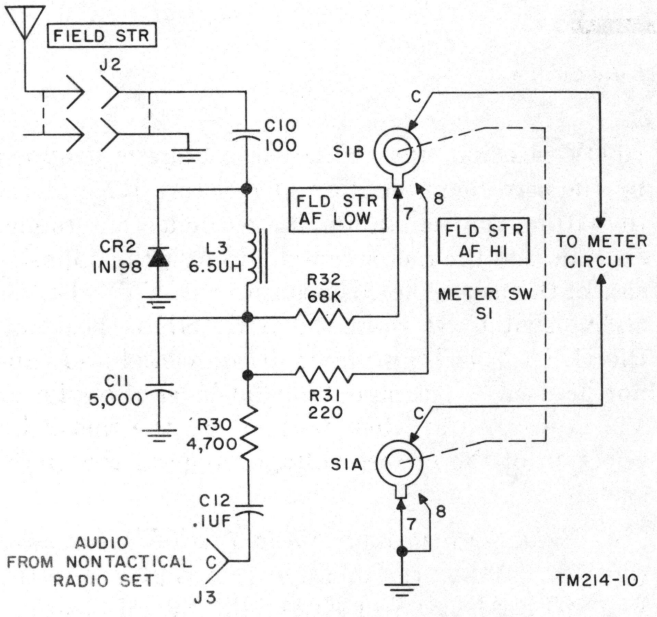


Figure 10. Field strength and audio frequency level positions of meter switch S1.

R30, dropping resistor R31 (or R32, depending on the position of the meter switch), and then to the meter circuit. The opposite meter terminal is grounded through section A of the meter switch. Resistors R31 and R32 decrease the signal level across the meter for either the low or high range selected by the meter switch. When field strength is measured, the RF signal is received by the antenna which is connected to the FIELD STR jack. The signal is coupled through capacitor C10, rectified positive by CR2, and filtered by coil L3 and capacitor C11. The resulting level is then decreased by resistor R31 (or R32) as selected by the meter switch and fed to the meter circuit of M1.

d. Current Measurement (fig. 11). In the 500MA position of the meter switch, the D. C. M. A. probe is used. Section C of the meter switch is disconnected. When the probe is connected to the proper current test jack on the nontactical radio set, it shunts a portion of the total radio-set current through resistor R8. The voltage developed across R8 is then applied through sections A and B of the meter switch to be measured on meter M1. Resistor R9, connected in series with R8, decreases the current so it does not exceed the meter capability.

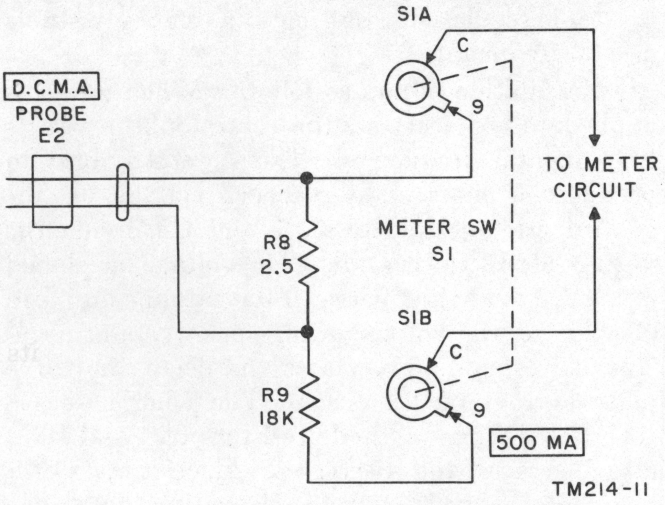


Figure 11. 500MA position of meter switch S1.

31. Meter Amplifier V1

(fig. 12)

a. Meter amplifier V1 is a balanced bridge-type circuit consisting of two triode amplifiers. Before signal is applied, current flowing through meter amplifier V1A is equal to current flowing through V1B because cathode resistor R17 is equal to R18 and plate load resistor R12 is equal to R14. Any unbalance is set by ZERO ADJUST control R13. The potential on the grids of V1 is zero. This balance establishes equal plate voltage and no current flows in the plate-to-plate circuit which includes resistors R15, R11, and meter M1 in parallel to resistor R10. The meter then reads zero. When a positive voltage is applied through the D. C. VOLTS input probe, it divides across resistor R1, the circuit described in paragraph 30*b*, the cathode-to-grid resistance of V1A, and resistor R18, causing a small change of potential on grid pin 2. Unbalance results as more current flows through V1A than V1B, which decreases the voltage on plate pin 1 relative to plate 6. This relative difference causes current to flow through the meter circuit.

b. Resistors R10, R11, and R15 limit the current flow through the meter. CAL ADJ control R11 is used to compensate for circuit variables and provide the correct full-scale meter reading. ZERO ADJUST control R13 balances the conduction of both tube halves to establish a zero reading on the meter with no input voltage. Capacitor C1 bypasses any RF voltages which may be present in the input.

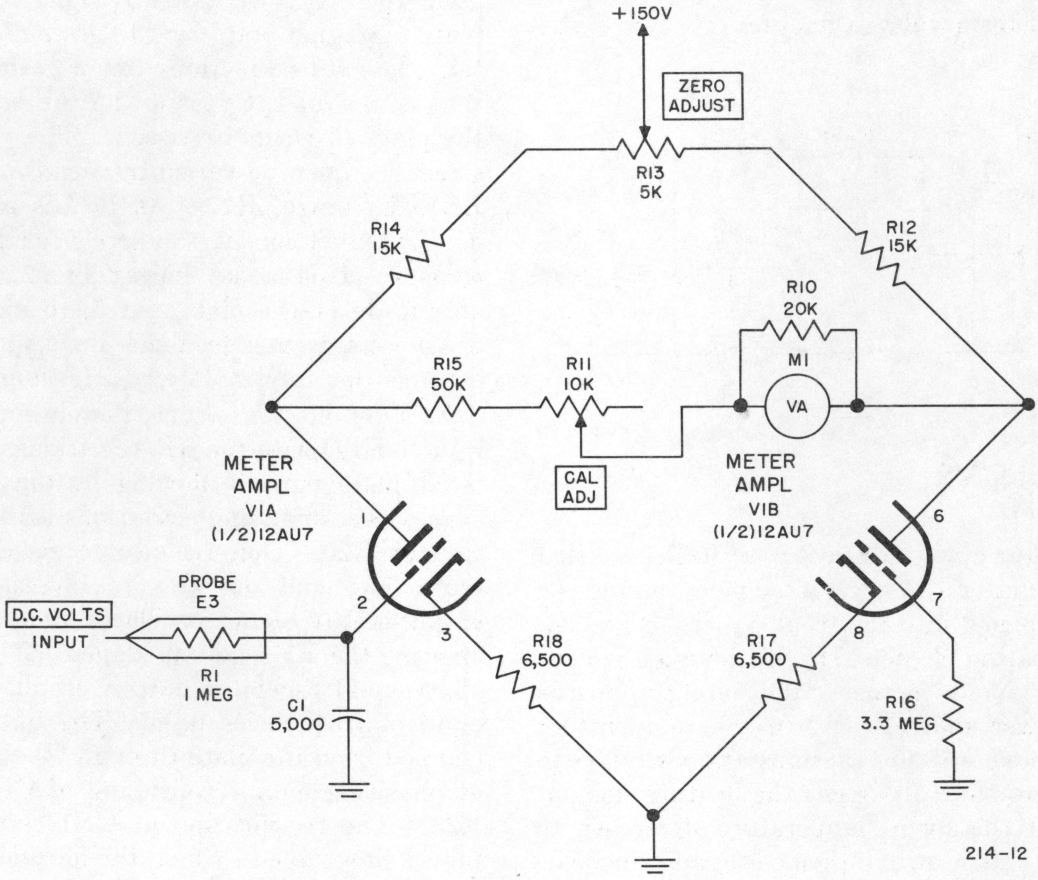


Figure 12. Meter amplifier V1, simplified schematic diagram.

c. If a negative voltage is measured with the D. C. VOLTS probe, an increase of plate pin 1 voltage occurs relative to plate pin 6 which reverses the current through the meter. In this case, the — + polarity switch located in the meter circuit (par. 32) is used to reverse the meter connections so that deflection is always up-scale.

32. Meter Circuit

(fig. 13)

The meter circuit receives voltages to be measured from meter switch S1. If the voltages deflect meter M1 in the wrong direction, polarity switch S2 is used for reversing the polarity. Fuse F1 protects the meter against overload. Capacitor C13 bypasses transient current surges so that the fuse does not blow unnecessarily. DAMPING SW S3 is a spring-returned switch which is closed by the test set cover when the test set is not in use. The switch prevents excessive movement of the meter needle from occurring as the test set is carried. The damping action occurs because S3 provides a heavy load for the generator-type action within the meter movement, thereby retarding needle wobble. Chokes L1 and L2 stop RF from entering the meter. Capacitor C2 shunts short-term voltage fluctuations across the meter.

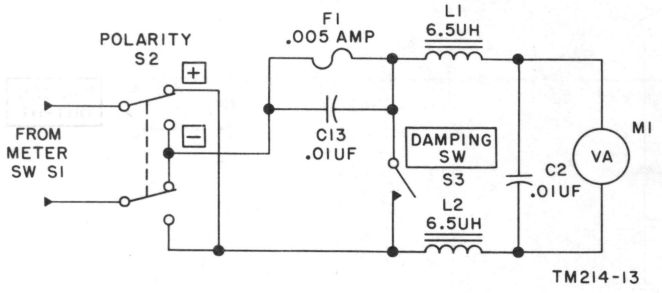


Figure 13. Meter circuit.

33. Oscillator V2

(fig. 14)

a. Oscillator circuit V2 uses a crystal-controlled Colpitts oscillator. A crystal oven containing the crystal is plugged into the front panel CRYSTAL socket. Heating element HR in the oven is activated by 6.3 volts (ac or dc depending upon the external power source). When the temperature increases above 75° C., thermostatic switch S in the oven automatically opens the heating element circuit until the oven temperature decreases to below 75° C. The switch then closes and the heating cycle is repeated. The temperature of the crystal is regulated, resulting in a relatively stable crystal frequency.

b. Oscillation occurs as follows: When power is applied to the test set, the crystal vibrates at its fundamental frequency. The crystal vibration produces a sinusoidally varying voltage on the control grid. Capacitors C7 and C8 divide the voltage across the crystal. The voltage developed across C7 is applied between the cathode and grid of V2. As the voltage swings positive and negative, corresponding increases and decreases in the plate current of V2 occur. The charge on C8 (connected across cathode resistors R24 and R25) also increases and decreases. Each time C8 is charged, energy is stored. Each time C8 is discharged through the crystal and C7, the stored energy is transferred in phase to the tank circuit to replace circuit losses and to maintain oscillations (vibrations of the crystal). The oscillator frequency can be varied slightly with SIG. GEN. FREQ. control C6. This control changes the effective overall capacity enough to produce several kilocycles variation in the harmonic frequencies later developed.

c. The screen grid of V2 acts as the anode of the oscillator. It is bypassed by capacitor C9 to complete the signal path back to ground and the crystal. The tube functions like a cathode follower; that is, the load (C8) is in the cathode circuit and the plate circuit is bypassed. The voltage at the screen grid can be varied by means of SIG. GEN. LEVEL control R27. As R27 is rotated clockwise, the voltage at the screen grid (anode) increases. This causes the gain of V2 and the signal amplitude at the plate, pin 5, to increase. This produces a greater feedback developed across C8, causing the amplitude of oscillations to increase.

d. As oscillations occur, the plate current of V2 is modulated with the RF variations. The modulated plate current flowing in the plate circuit causes corresponding variations across plate load resistor R20. Coil L4 also forms a part of the plate load and operates to increase the signal amplitude at higher oscillator frequencies by increasing the RF load impedance. This provides a more equal oscillator output amplitude over the band of frequencies used. The output of V2 is coupled from the plate through C4 to a harmonic-emphasizing circuit consisting of CR1, R22, and R23. The rectification at CR1 results in a distorted sine wave in which the harmonic content is emphasized. From the harmonic emphasizing

circuit, the RF is coupled through C5 to SIG. GEN. OUTPUT jack J1.

e. A portion of the oscillator output is coupled through C4, R29, and S4 to the meter circuit when VTVM-SIG. GEN. switch S4 is in the SIG. GEN. position. This permits a relative indication of the rf output level obtainable.

f. The oscillator circuit uses cathode bias developed across R24 and grid leak bias developed by C6, C7, and C8 in series, and R21. B+ for the plate and screen circuits is obtained through decoupling network R19 and C3.

34. Power Supply

(fig. 21)

a. When the ac power cord is used, 115 volts ac enters the test set through contacts F and H of POWER connector J3. The voltage is stepped up on winding 5–6 of transformer T1 and the current is half-wave rectified by CR3. The resultant pulsating positive dc is filtered by the combination of sections A and B of capacitor C14 and resistor R34. A B+ voltage of slightly greater than +150 volts develops across bleeder resistor R38.

b. The 6.3 volts for the tube filaments and crystal oven heating element is obtained from winding 3–4 of transformer T1. The 6.3 volts is jumpered through contacts G and E of the ac power cord. Winding 3–4 is disconnected from the 6.3-volt line when external 6.3 volts is supplied to the test set (ac power cord not used) through contact E of POWER connector J3 (*c* below).

c. The power supply circuit contained in the test set is bypassed when the receiver power cord is used. In this case, power is obtained from the nontactical radio set. The +150 volts and 6.3 volts are received through contacts D and E respectively of POWER connector J3.

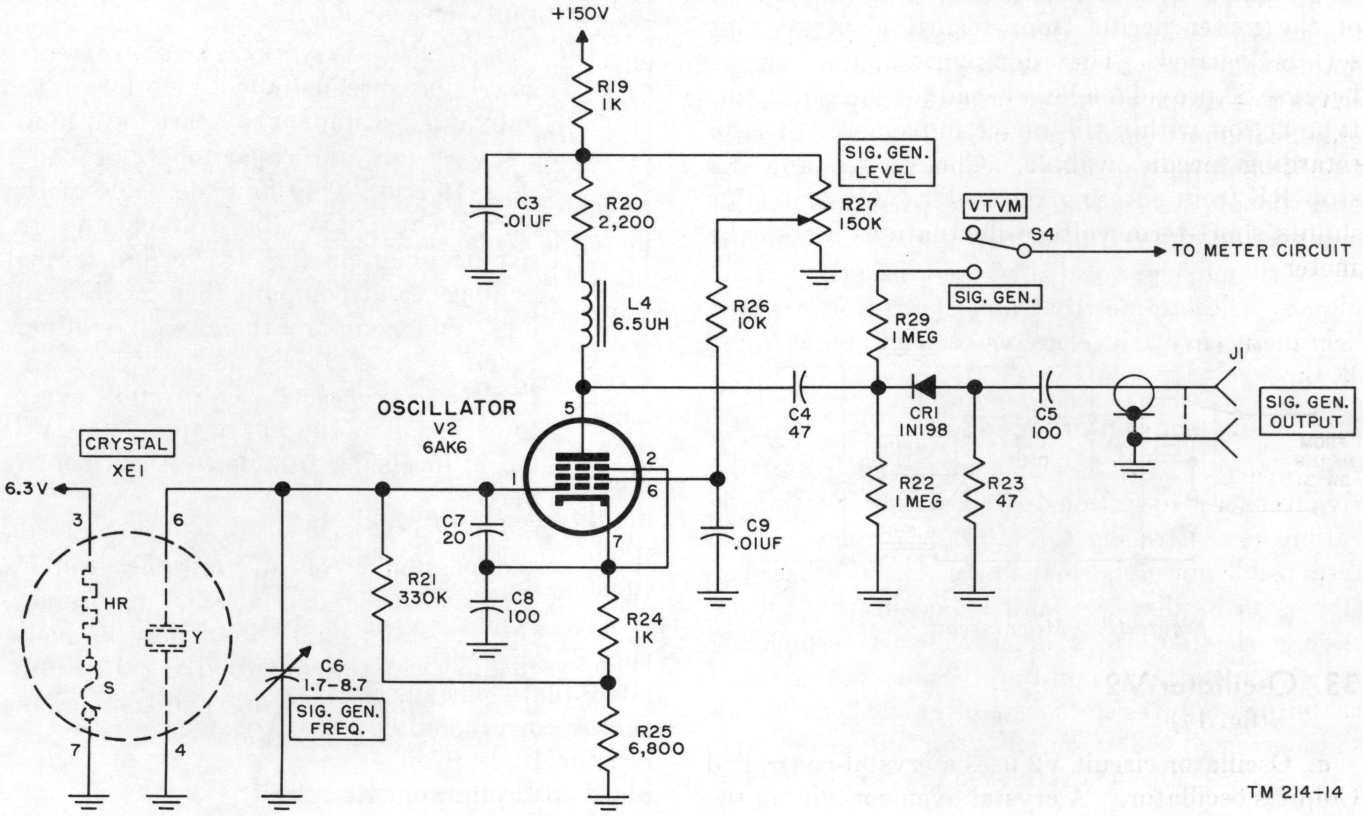


Figure 14. Oscillator V2.

CHAPTER 5
FIELD MAINTENANCE

Section I. GENERAL TROUBLESHOOTING TECHNIQUES

Warning: When servicing the test set while power is applied, be careful to avoid electrical shocks from contact with the 115-volt ac or +150-volt dc voltage at exposed terminals. After power is disconnected, some capacitors may retain a charge. Before touching exposed parts, short the part to ground.

35. General Instructions

Troubleshooting at field maintenance level includes all techniques outlined for organizational maintenance and any special or additional techniques to isolate a defective part. The field maintenance procedures are not complete in themselves but supplement the procedures described in organizational maintenance. The systematic troubleshooting procedure, which begins with the operational checks that can be performed at an organizational level, must be completed by means of sectionalizing, localizing, and isolating techniques. Techniques that must be performed at a field maintenance level are described in paragraphs 38 through 41.

36. Troubleshooting Procedures

a. General. The first step in servicing a defective test set is to sectionalize the fault. Sectionalization means tracing the fault to a major circuit responsible for abnormal operation. The second step is to localize the fault. Localization means tracing the fault to a defective part responsible for the abnormal condition. Some faults, such as burned-out resistors can often be located by sight or smell. The majority of faults, however, must be localized by checking voltages and resistance.

b. Sectionalization. The first step in tracing trouble is to locate the circuit at fault by the following methods:

(1) *Visual inspection.* Visual inspection helps to locate faults without testing or measuring circuits. All meter readings or other visual signs should be observed and an attempt made to sectionalize the fault to a particular circuit.

(2) *Operational tests.* Operational tests frequently indicate the general location of trouble. In many instances, the tests will help in determining the exact nature of the fault. The equipment performance checklist (par. 22) is a good operational test.

c. Localization. The tests listed below will aid in isolating the trouble. First, localize the trouble to a single stage or circuit, and then isolate the trouble within that circuit by voltage, resistance, and continuity measurements.

(1) *Voltage and resistance measurements.* These measurements will help locate the individual component part at fault. Use resistor and capacitor color codes (figs. 19 and 20) to find the value of the components. Use the voltage and resistance diagram (fig. 18) to find normal readings, and compare them with readings, and compare them with readings taken.

(2) *Troubleshooting chart.* The trouble symptoms listed in the chart (par. 39*d*) will aid in localizing trouble to a component part.

(3) *Intermittent troubles.* In all these tests, the possibility of intermittent troubles should not be overlooked. If present, this type of trouble often may be made to appear by tapping or jarring the equipment. Check the wring and connections to the nontactical radio set.

37. Test Equipment Required

The following chart lists the test equipment required for troubleshooting the test set, associated technical manuals, and assigned common names.

Test equipment	Technical manual	Common name
Multimeter ME–77/U		Multimeter.
Electron Tube Test Set TV–7/U.	TM 11–5083	Tube tester.

Section II. TROUBLESHOOTING

38. Checking Filament and B+ Circuits for Shorts

a. When To Check. When any of the following conditions exist, check for short circuits and clear the troubles before applying power.

(1) When the nature of the trouble symptom is not known.

(2) When trouble symptoms reported from operational tests indicate possible power supply troubles.

b. Conditions for Tests. To prepare for the short-circuit tests:

(1) Remove the test set front panel from its case (par. 42*b*).

(2) Remove all tubes and the crystal oven if plugged into the CRYSTAL socket.

(3) Do not connect the ac power cord and receiver power cord.

(4) Set the meter switch to the 500 MA position.

c. Measurements. Make the resistance measurements indicated in the following chart. Resistance can vary between equipments. More than 20 percent difference with the chart indications should be considered abnormal. If abnormal results are obtained, perform the additional isolating procedures outlined. When the faulty part is found, repair the trouble before applying power to the unit.

Short-circuit tests

Point of measurement	Normal indication	Isolating procedure
Between terminals A and D of POWER connector J3; put positive probe on D.	95,000 ohms; charge of filter capacitor will occur.	If resistance is low, check capacitors C14A and B, C3, and C9. Check rectifier CR3 and wiring.
Between terminals A and E of POWER connector J3.	Infinite resistance	If resistance is finite, check wiring.
Between terminals A and G of POWER connector J3.	.3 ohm	If resistance is zero or infinite, check winding 3–4 of transformer T1.
Between terminal A and connector body of ac and receiver power cords.	Infinite resistance	If finite resistance is obtained, check for short in power cord.
Between terminal E and connector body of ac and receiver power cords.	Infinite resistance	If finite resistance is obtained, check for short in power cord.
Between terminals F and H of POWER connector J3.	50 ohms	If resistance is zero or infinite, check primary of T1.

39. Localizing Troubles

a. General. In the troubleshooting chart (*d* below), procedures are outlined for localizing troubles to a stage within the various sections of the test set. Parts locations are indicated in figures 16 and 17. A simplified schematic diagram of B+ voltage distribution is shown in figure 15. Voltage and resistance measurements are shown in figure 18. Depending on the nature of the operational symptoms, one or more of the localizing procedures will be necessary. When trouble has been localized to a particular stage, use voltage and resistance measurements to isolate the trouble to a particular part.

b. Use of Chart. The troubleshooting chart supplements the equipment performance check list (par. 22). If no operational symptoms are known, begin with item 1 of the equipment performance check list and proceed until a symptom of trouble appears.

Caution: If operational symptoms are not known or if they indicate the possibility of short circuits within the test set, make the short-circuit check described in paragraph 38 before applying power to the unit.

c. Conditions for Tests. All checks outlined in the chart (with the exception of step 1) are to be conducted with the test set connected to a 115-volt ac power source.

d. Troubleshooting Chart.

Symptom	Probable trouble	Correction
1. No voltage measurement or signal generation when using the receiver power cord.	No power obtained through receiver power cord.	Check if power exists in receiver of nontactical radio set. Check receiver power cord.
2. No voltage measurement or signal generation possible when using the ac power cord.	Transformer T1, rectifier CR3, capacitor C14A and B, or resistor R34 defective.	Check power supply components listed. Replace defective component. Check ac power cord.
3. No meter measurement of any kind possible.	Fuse F1 blown. Meter M1, coil L1 or L2, capacitor C2, switch S1, S2, or S3 defective.	Check components listed. Replace defective component.
4. No voltage measurement possible on 3V, 10V, 30V, 100V, or 300V meter ranges.	Tube V1 or associated components defective. Switch S1, R4 through R7, R33, or capacitor C1 defective.	Check voltage and resistance at tube V1 socket (fig. 18). Repair or replace defective component. Check COMMON cable continuity.
5. No voltage measurement possible	Switch S4 or resistor R1 in D. C. VOLTS probe defective.	Check D. C. VOLTS probe. Repair or replace defective component.
6. No voltage measurement possible on 1000V meter range.	Resistors R2, R3, or switch S1 defective.	Repair or replace defective component.
7. No RF output on signal generator function.	Tube V2 or associated components defective. Sig gen cable defective. SIG. GEN. FREQ. control C6 plates shorted.	Check voltage and resistance at tube V2 socket (fig. 18). Replace defective component.
8. No field-strength or audio level measurement possible.	Capacitor C11 or rectifier CR2 defective. If measurement is not possible on low or high range only, check resistor R31 or R32, and switch S1.	Check resistance of components. Repair or replace defective component.
9. No field-strength measurement possible.	FIELD STR jack J2 or capacitor C10 defective.	Repair or replace defective component.
10. No audio level measurement possible.	Capacitor C12, resistor R30, or power cord defective.	Repair or replace defective component. Use other power cord to establish whether one in use is defective.
11. No current measurement possible	D. C. M. A. probe, resistors R8 and R9, or switch S1 defective.	Repair or replace defective component.
12. Known voltages less than 300 volts measure incorrectly.	CAL ADJ adjustment R11 improperly set.	Adjust this control (par. 43*b*).

40. Isolating Trouble Within Stage

When trouble has been localized to a stage, either through operational checks or by use of the troubleshooting charts, use the following techniques to isolate the defective part:

a. Test the tube involved by using either Electron Tube Test Set TV–7/U or by substituting a similar type tube which is known to be operating normally.

b. Take voltage measurements at the tube sockets (fig. 18) and other points related to the stage.

c. If voltage readings are abnormal, take resistance readings (fig. 18) to isolate open and short circuits. Refer also to the dc resistances of transformers and coils in paragraph 41.

41. Dc Resistances of Transformer and Coils

The dc resistances of the transformer windings and coils in the test set are listed below:

Transformer or coil	Terminals	Ohms
T1	1–2	50.
	3–4	Less than 1 ohm.
	5–6	63.
L1		Less than 1 ohm.
L2		Less than 1 ohm.
L3		Less than 1 ohm.
L4		Less than 1 ohm.

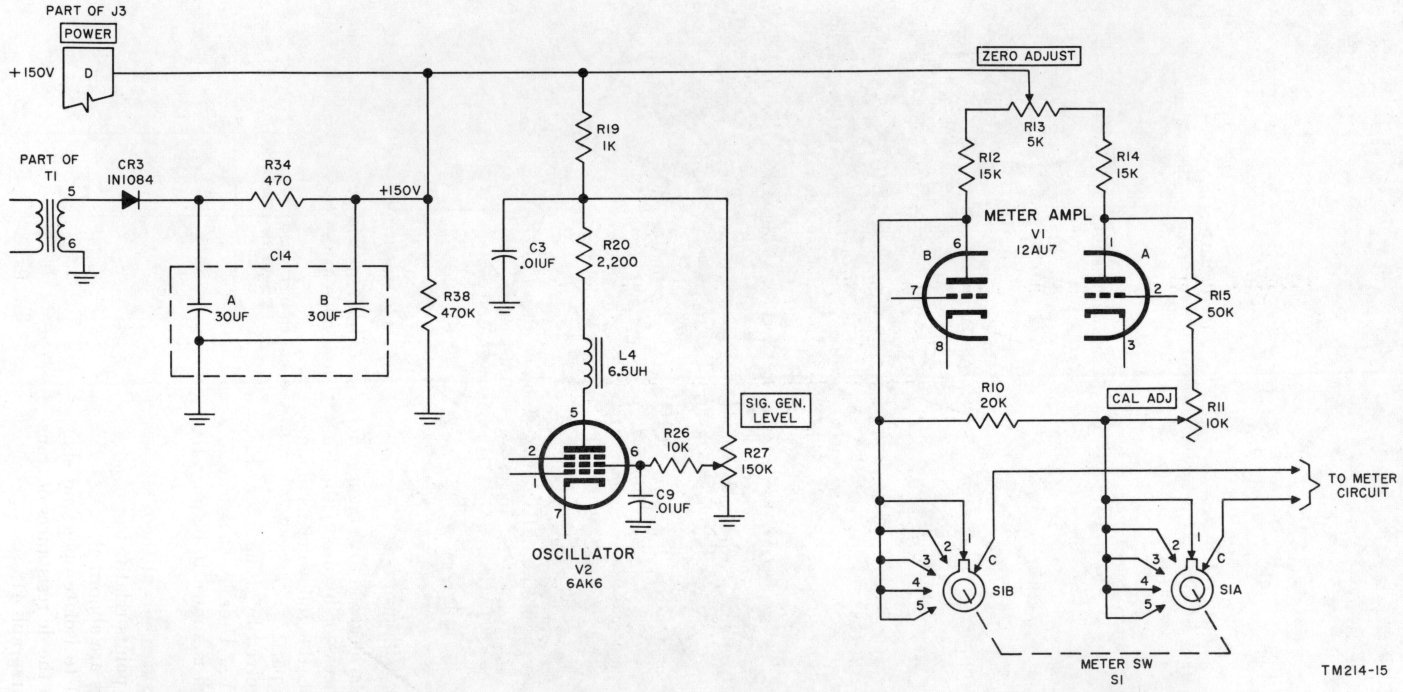


Figure 15. B+ distribution.

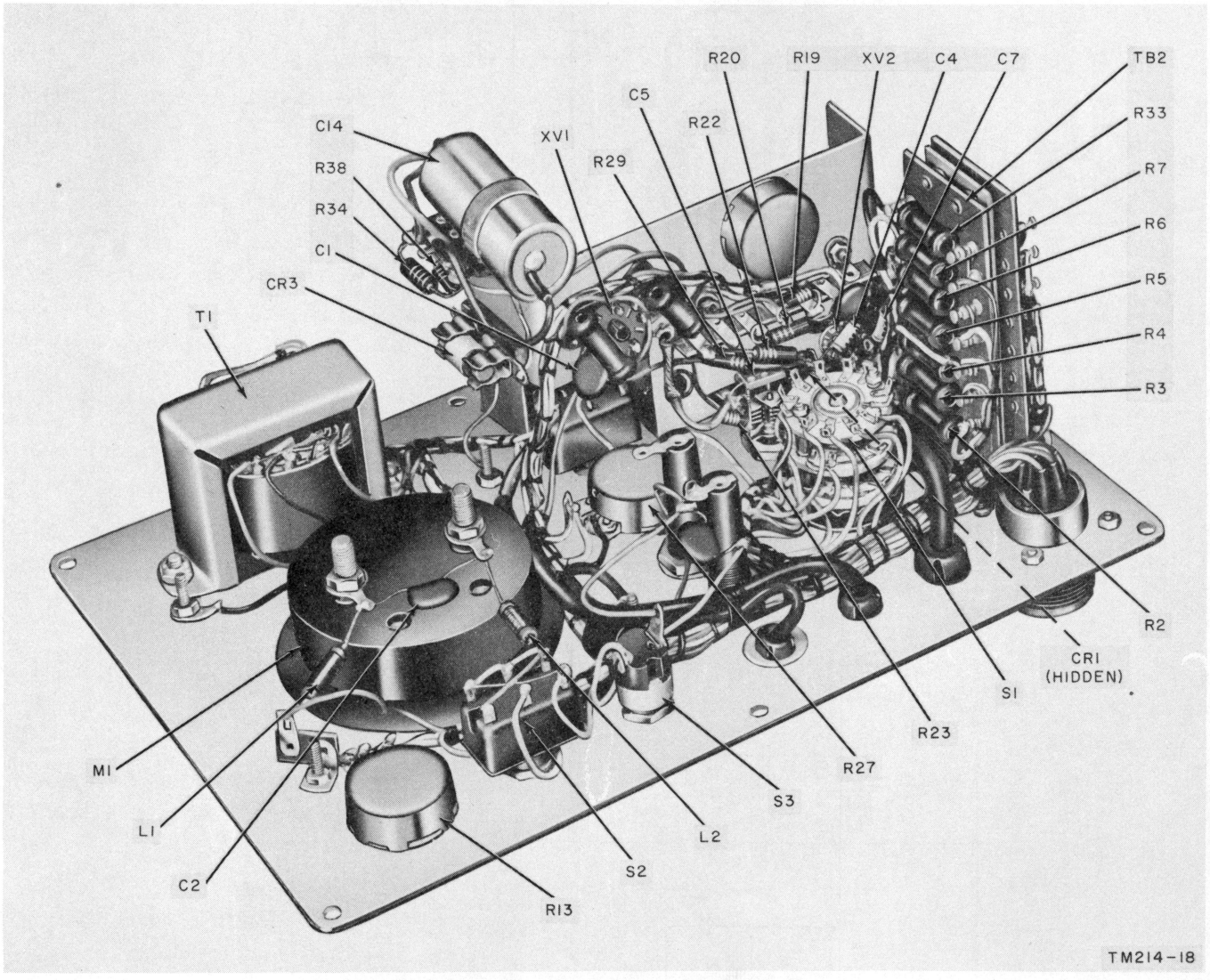


Figure 16. Bottom oblique view of chassis.

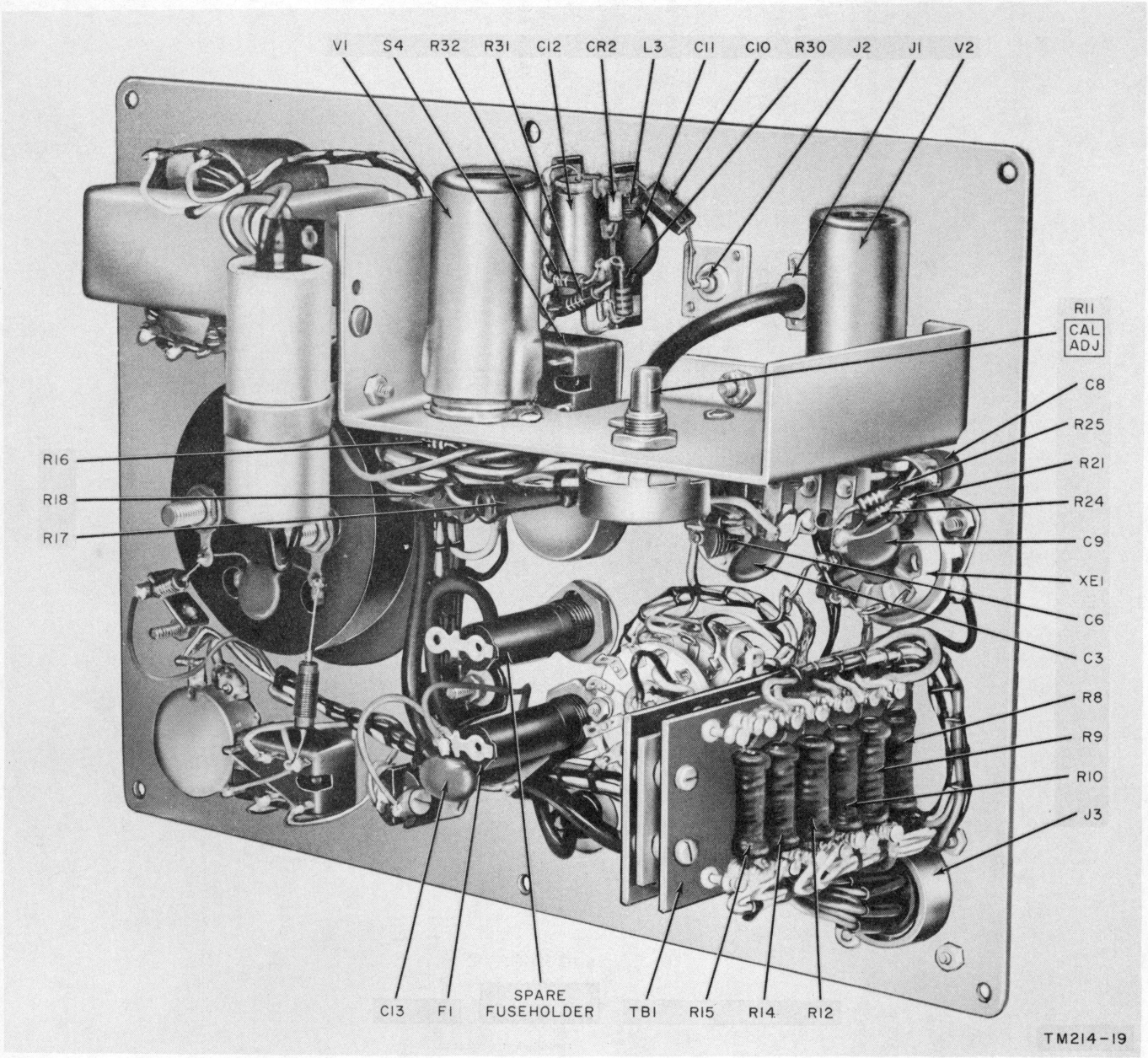
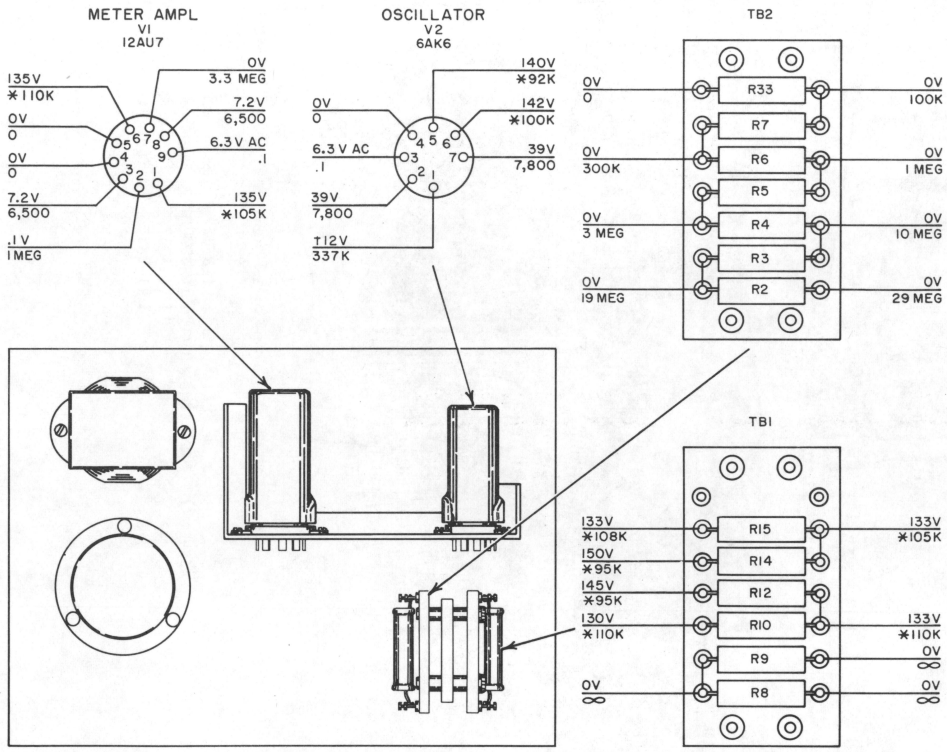


Figure 17. Right oblique view of chassis.



NOTES:

1. MEASUREMENTS WERE MADE UNDER THE FOLLOWING CONDITIONS;
   - A. USING AC POWER CORD. (READINGS MADE USING RECEIVER POWER CORD MAY READ 5% LESS).
   - B. LINE VOLTAGE: 115 V AC, 60 CPS.
   - C. CRYSTAL UNIT: PLUGGED INTO CRYSTAL SOCKET.
   - D. METER SWITCH: SET TO 30V
     SIG. GEN. LEVEL: FULLY CW.
     VTVM–SIG. GEN.: SET TO VTVM.
2. UNLESS OTHERWISE SPECIFIED, ALL VOLTAGES ARE DC POSITIVE, MEASURED TO CHASSIS GROUND USING A 20,000 OHMS-PER-VOLT METER.
3. UNLESS OTHERWISE SPECIFIED, ALL RESISTANCE READINGS ARE IN OHMS, MEASURED TO CHASSIS GROUND.

* CAPACITOR CHARGE OCCURS.
† MEASURED WITH VTVM.
∞ INFINITE RESISTANCE.

TM 214-21

Figure 18. Voltage and resistance diagram.

Section III. REPAIRS AND ADJUSTMENTS

42. General Parts-Replacement Techniques

a. General. All parts of the test set can be reached and replaced easily without special procedures. Do not disturb the setting of internal CAL ADJ control R11 or short the plates of SIG. GEN. FREQ. control C6. See figures 16 and 17 for the location of individual parts.

b. Removal of Test Set Chassis. To remove the test set from its housing, release the five luggage-type catches and slide the test set cover off the hinge. Remove the six screws around the edges of the front panel and carefully remove the front panel from the housing.

43. Adjustments

a. Test Equipment Required for Adjustment.

Test equipment	Common name
Meter Test Set TS–682A/GSM–1 (TM 11–2535B).	Meter test set.

b. CAL ADJ Control Adjustment Procedure.

(1) Position the test set controls as follows:
  (*a*) Meter switch to 3V.
  (*b*) VTVM-SIG. GEN. switch to VTVM.
  (*c*) Polarity switch to +.

(2) Energize the meter test set.

(3) Connect the ac power cord to the test set and the 115-volt ac outlet. Allow the test equipment to warm up for 1 minute.

(4) Adjust the meter test set output to exactly 3 volts.

(5) Temporarily short the D. C. VOLTS probe to the COMMON cable and set the ZERO ADJUST control for zero meter reading.

(6) Remove the short and connect the D. C. VOLTS probe to the positive output terminal and the COMMON cable to the negative output terminal of the meter test set.

(7) Adjust the CAL ADJ control in the test set until the test set meter reads exactly 3 volts.

(8) Repeat the steps in (5), (6), and (7) above until it is unnecessary to reset either the ZERO ADJUST or CAL ADJ control.

c. SIG. GEN. FREQ. Control Adjustment Procedure.

(1) Position SIG. GEN. FREQ. control C6 so that the capacitor plates are half-meshed and so that turning clockwise will unmesh them.

(2) Loosen the knob setscrew and set the knob so pointer is up. Retighten the setscrew with the Bristo wrench.

Section IV. FINAL TESTING

44. Purpose of Final Testing

The tests outlined in this section are designed to measure the performance capability of a repaired equipment. Equipment that meets the minimum standards stated in the tests will furnish satisfactory operation.

45. Test Equipment Required for Final Testing

The test equipment required for final testing is given in the following chart:

Item	Manual	Common name
Multimeter ME–77/U	TM 11–5562	Standard multimeter.
Signal Generator TS–497B/URR	TM 11–5030A	Standard signal generator.
Frequency Meter AN/USM–26	TM 11–5057	Frequency meter.
Radio Set AN/VRC–6	TM 11–283	Radio set or AN/VRC–6.
Meter Test Set TS–682A/GSM–1	TM 11–2535B	Meter test set.
3-volt battery source.		

46. Tests

a. Voltmeter.

(1) Connect the ac power cord to the test set and the 115-volt ac outlet.

(2) Set the VTVM-SIG. GEN. switch to VTVM and the polarity switch to +.

(3) Short the D. C. VOLTS probe to the COMMON cable and zero the meter with the ZERO ADJUST control.

(4) Remove the short and connect the D. C. VOLTS probe to the positive output terminal and the COMMON cable to the negative output terminal of the meter test set.

(5) Adjust the meter test set to obtain the radio test set meter reading listed in the chart below. The meter test set reading should be ±10 percent of the radio test set meter reading as indicated.

Meter switch position	Radio test set meter reading (v)	Meter test set reading (v)
3V	3	2.7 to 3.3.
10V	3	2.7 to 3.3.
10V	10	9 to 11.
30V	10	9 to 11.
30V	30	27 to 33.
100V	30	27 to 33.
100V	100	90 to 110.
300V	100	90 to 110.
300V	300	270 to 330.
1000V	300	270 to 330.
1000V	750	675 to 825.

b. Signal Generator.

(1) Energize a Radio Set AN/VRC–6.

(2) Select a type CR–27/U crystal by using the following formula and install it in the crystal oven:

$$\text{Crystal frequency (mc)} = \frac{\text{receiver frequency (AN/VRC–6)}}{16}$$

(3) Plug the oven into the CRYSTAL socket of test set and connect the ac power cord. Allow a 5-minute warm-up period.

(4) Set the VTVM-SIG. GEN. switch to the SIG. GEN. position and the meter switch to the 30V position. A meter reading should be obtained.

(5) Connect the sig gen cable between the SIG. GEN. OUTPUT jack and the frequency meter.

(6) Vary the SIG. GEN. FREQ. control 1 full turn and observe the lowest and highest fundamental crystal frequency on the frequency meter counter. (The lower frequency occurs near the point where the SIG. GEN. FREQ. knob points left, while the high frequency occurs near the point where the knob points right.) The separation between the two frequencies should be at least 500 cycles.

(7) Measure the discriminator idle (no-signal) voltage of the AN/VRC–6.

(8) Disconnect the sig gen cable from the frequency meter and connect the cable to the antenna input of Radio Set AN/VRC–6.

(9) Adjust the SIG. GEN. FREQ. control to obtain the same idle voltage as was measured in (7) above.

(10) Set the SIG. GEN. LEVEL control fully counterclockwise and then fully clockwise while measuring the low and high voltage at the receiver 2ND IF test point.

(11) Disconnect the test set sig gen cable from the AN/VRC–6 antenna and connect the signal output cable from the standard signal generator to the AN/VRC–6 antenna.

(12) With the standard signal generator set for the same frequency as the receiver, adjust the output level to obtain the same low and high voltage at the 2ND IF test point of the receiver as was measured in (10) above. The low limit should be less than 2 microvolts. The high limit should be more than 100 microvolts.

c. Milliammeter.

(1) Connect the prongs of the D. C. M. A. probe in series with a standard multimeter (set to measure 500 ma) and a variable 5-watt, 100-ohm reistor. Connect the end leads of the series network to a 3-volt battery source capable of supplying 500 ma. Connect a 10-ohm, ½-watt resistor across the two prongs of the D. C. M. A. probe.

(2) Set the meter switch on the test set to the 500 ma position.
(3) Adjust the variable resistance for a reading of 500 ma on the test set. The standard multimeter should read between 475 and 525 ma.
(4) Adjust the variable resistance for a reading of 250 ma on the test set. The standard multimeter should read between 237 and 263 ma.

d. Field-Strength Meter.

(1) Connect the test set antenna to the FIELD STR jack.
(2) Couple the output of the standard signal generator to the test set antenna by winding a few turns of the output lead around the antenna.
(3) Set the meter switch to FLD STR AF LOW position.
(4) Set the standard signal generator frequency to approximately 160 mc and adjust the output level for three-fourths of full-scale reading on the test set.
(5) Set the meter switch to FLD STR AF HI position. The meter reading should indicate approximately one-fourth of full scale.

e. Audio Level Meter.

(1) Use the ac power cord connected to the POWER jack on the test set and connect the audio input lead (red lead with alligator clip) to terminal 10 of TB251 in the receiver of the AN/VRC–6.
(2) Set the meter switch to the FLD STR AF LOW position.
(3) Turn off the squelch and increase the volume of noise level to obtain a reading on the test set meter.

CHAPTER 6

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

47. Disassembly of Equipment

To prepare the test set for shipment and storage, proceed as follows:

a. Disconnect all leads and power cords.

b. Place the test set cables, spare tubes and fuses, and alinement tools into the compartment below the front panel.

c. Telescope the antenna and fix it and the Bristo wrench in place inside the front cover (fig. 2).

d. Set the hinged front panel cover into place and fasten with the five luggage-type catches.

e. Place the test set in the canvas bag. Position the handle to fit through the opening and close the slide fastener.

48. Repackaging for Shipment or Limited Storage

The exact procedure for repackaging depends on the material available and the conditions under which the equipment is to be shipped or stored. Use the procedures outlined below whenever possible.

a. Material Requirements.

(1) The following materials are required for packaging the test set.

Material	Quantity
Corrugated cardboard	10 sq. ft.
Filler material	3 lb.
Gummed tape	5 ft.
Waterproof paper	6 sq. ft.
Metal strapping	10 ft.

(2) Construct a wooden box the inside dimensions of which are approximately 15 by 15 by 9 inches.

b. Packaging. Cushion the test set on all surfaces with pads of filler material. Place the cushioned unit within a wrap of corrugated cardboard. Secure the wrap with gummed tape. Place the package into the wooden box after lining the inside with waterproof paper. Fill excess space in the box with pads of corrugated cardboard and filler material. Use metal strapping around the box if intertheater shipment is intended.

Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

49. Authority for Demolition

The demolition procedures given in paragraph 50 will be used to prevent the enemy from using or salvaging this equipment. Demolition of the equipment is accomplished only upon the order of the commander.

50. Methods of Destruction

a. Smash. Smash the tubes, controls, coils, switches, capacitors, and transformer; use sledges, axes, handaxes, hammers, crowbars, or other heavy tools.

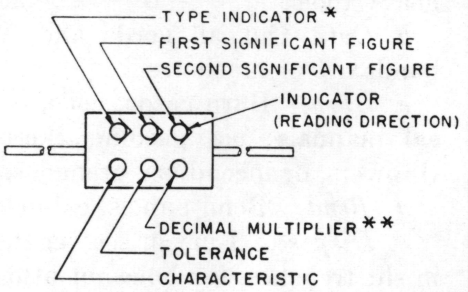
b. Cut. Cut all cords and wiring; use axes, handaxes, or machetes.

c. Burn. Burn cords, coils, wiring and technical manuals; use gasoline, kerosene, oil, flame throwers, or incendiary grenades.

d. Bend. Bend panels, cabinet, and chassis.

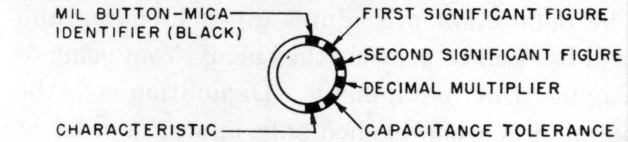
e. Dispose. Bury or scatter the destroyed parts in slit trenches, fox holes, or other holes, or throw them into streams.

CAPACITOR COLOR CODE MARKING
(MIL-STD CAPACITORS)

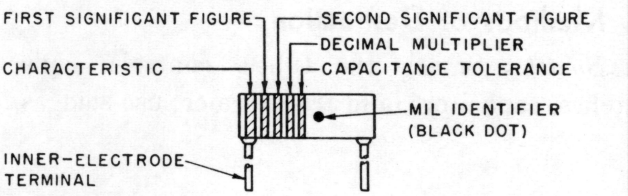


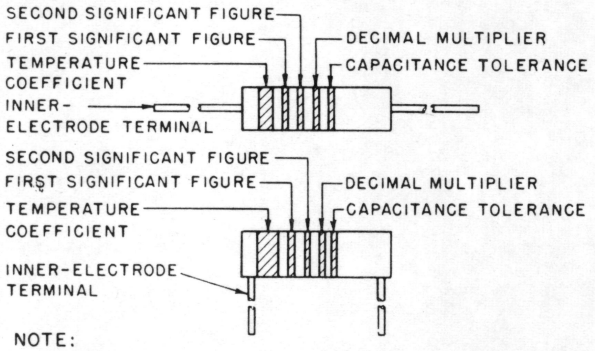
* BLACK DOT: MICA DIELECTRIC
SILVER DOT: PAPER DIELECTRIC
**INDICATES NUMBER OF ZEROS ON PAPER TYPE.

MICA (CM) AND PAPER (CN)



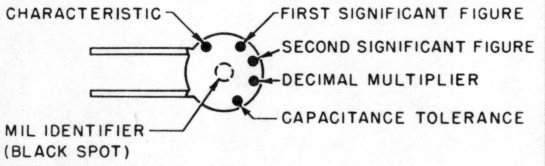
BUTTON-MICA (CB)





NOTE:
SPOTS MAY BE USED INSTEAD OF BANDS; TEMPERATURE COEFFICIENT MARKING IS LARGER.

CERAMIC-TEMPERATURE COMPENSATING (CC)



NOTES:
1. SPOTS MAY BE USED ON TUBULAR CAPACITORS; CHARACTERISTIC SPOT IS LARGER AND MIL IDENTIFIER IS ON SIDE DIAMETRICALLY OPPOSITE COLOR SPOTS.
2. MIL IDENTIFIER OF DISK TYPE IS ON REVERSE SIDE; CHARACTERISTIC SPOT IS LARGER OR SPACE BETWEEN CHARACTERISTIC AND TOLERANCE SPOTS IS THREE TIMES SPACE BETWEEN ADJACENT SPOTS.
3. TOLERANCE: YELLOW, +100%, -20%.

CERAMIC-GENERAL PURPOSE (CK)

CAPACITOR COLOR CODE

COLOR	SIG FIG.	MULTIPLIER		CHARACTERISTIC[1]				TOLERANCE [2]					TEMPERATURE COEFFICIENT (UUF/UF/°C)
		DECIMAL	NUMBER OF ZEROS	CM	CN	CB	CK	CM	CN	CB	CC		
											OVER 10UUF	10UUF OR LESS	CC
BLACK	0	1	NONE		A			20	20	20	20	2	ZERO
BROWN	1	10	1	B	E	B	W				1		-30
RED	2	100	2	C	H		X	2		2	2		-80
ORANGE	3	1,000	3	D	J	D			30				-150
YELLOW	4	10,000	4	E	P								-220
GREEN	5		5	F	R						5	0.5	-330
BLUE	6		6		S								-470
PURPLE (VIOLET)	7		7		T	W							-750
GRAY	8		8			X						0.25	+30
WHITE	9		9								10	1	-330(±500) [3]
GOLD		0.1						5		5			+100
SILVER		0.01						10	10	10			

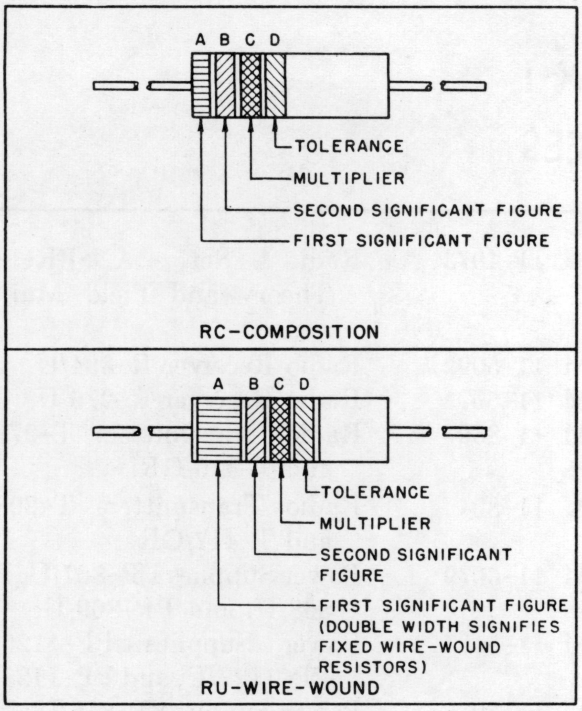
1. LETTERS ARE IN TYPE DESIGNATIONS GIVEN IN MIL-C SPECIFICATIONS.
2. IN PERCENT, EXCEPT IN UUF FOR CC-TYPE CAPACITORS OF 10 UUF OR LESS.
3. INTENDED FOR USE IN CIRCUITS NOT REQUIRING COMPENSATION.

STD-CI

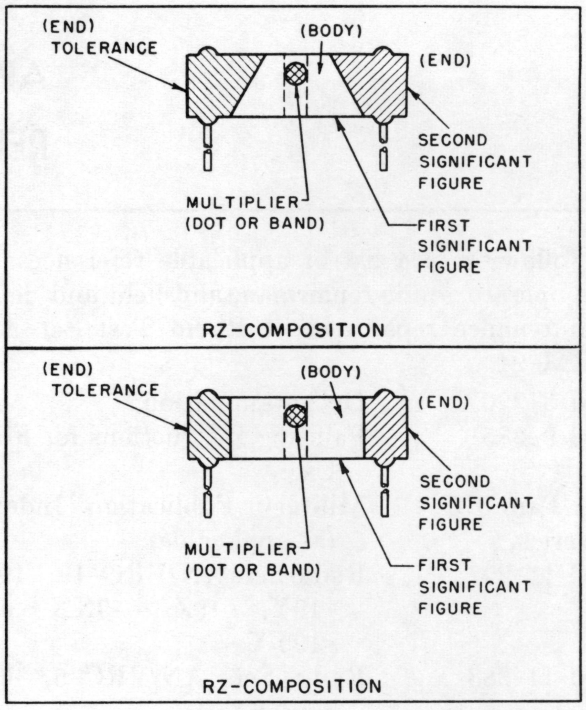
Figure 19. MIL-STD resistor color-code marking.

RESISTOR COLOR CODE MARKING
(MIL-STD RESISTORS)

AXIAL-LEAD RESISTORS (INSULATED)



RADIAL-LEAD RESISTORS (UNINSULATED)



RESISTOR COLOR CODE

BAND A OR BODY*		BAND B OR END*		BAND C OR DOT OR BAND*		BAND D OR END*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1	BODY	± 20
BROWN	1	BROWN	1	BROWN	10	SILVER	± 10
RED	2	RED	2	RED	100	GOLD	± 5
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000		
GREEN	5	GREEN	5	GREEN	100,000		
BLUE	6	BLUE	6	BLUE	1,000,000		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7				
GRAY	8	GRAY	8	GOLD	0.1		
WHITE	9	WHITE	9	SILVER	0.01		

*FOR WIRE-WOUND-TYPE RESISTORS, BAND A SHALL BE DOUBLE-WIDTH. WHEN BODY COLOR IS THE SAME AS THE DOT (OR BAND) OR END COLOR, THE COLORS ARE DIFFERENTIATED BY SHADE, GLOSS, OR OTHER MEANS.

EXAMPLES (BAND MARKING):
10 OHMS ±20 PERCENT: BROWN BAND A; BLACK BAND B; BLACK BAND C; NO BAND D.
4.7 OHMS ±5 PERCENT: YELLOW BAND A; PURPLE BAND B; GOLD BAND C; GOLD BAND D.

EXAMPLES (BODY MARKING):
10 OHMS ±20 PERCENT: BROWN BODY; BLACK END; BLACK DOT OR BAND; BODY COLOR ON TOLERANCE END.
3,000 OHMS ±10 PERCENT: ORANGE BODY; BLACK END; RED DOT OR BAND; SILVER END.

STD-RI

Figure 20. MIL-STD capacitor color-code marking.

APPENDIX I
REFERENCES

Following is a list of applicable references for the operator, unit repairman, and field and depot maintenance repairman of Radio Test Set AN/URM–94.

TM 3–220	Decontamination.
TM 9–2851	Painting Instructions for Field Use.
DA Pam 310-series.	Military Publication Indexes (as applicable).
TM 11–297	Radio Sets AN/VRC–19, –19X, –19Y, –19Z, –19XX, and –19YY.
TM 11–283	Radio Sets AN/VRC–6, –6X, and –6Y.
TM 11–282	Radio Set AN/FRC–15.
TM 11–691	Radio Set AN/TRC–22.
TM 11–226	Radio Sets AN/FRC–27 and AN/TRC–34.
TM 11–252	Radio Set AN/TRC–28.
TM 11–225	Radio Receiving Set AN/FRR–44.
TM 11–229	Radio Receiving Set AN/FRR–36 and AN/VRR–7.
TM 11–610	Radio Set AN/PRC–21, Operation and Organizational Maintenance.
TM 11–4073	Radio Set AN/PRC–21, Theory and Field Maintenance.
TM 11–5092	Radio Receiver R–394/U.
TM 11–5071	Radio Receiver R–275/U.
TM 11–839	Radio Transmitters T–278/U and T–416/GR.
TM 11–804	Radio Transmitters T–208/U and T–417/GR.
TM 11–5079	Power Supplies PP–867/U, PP–868/U, and PP–869/U.
TM 11–5104	Power Supplies PP–1126/U, PP–1127/U, and PP–1128/U.
TM 11–5078	Power Supply PP–846/U.
TM 11–5076	Dynamotor-Power Supplies DY–93/G, DY–98/G, and DY–100/U.
TM 11–5552	Dynamotor-Power Supplies DY–121/U, DY–131/U, and DY–132/U.
TM 11–5072	Power Supply PP–804/U.
TM 11–5093	Radio Frequency Amplifier AM–494/GR.
TM 11–5541	Radio Frequency Amplifier AM–495/GR.
TM 11–992	Power Supply PP–638/U.

[AG 413.44 (11 Jan 58)]

APPENDIX II

MAINTENANCE ALLOCATION CHART

FOR

TEST SET, RADIO AN/URM-94

Section I. PREFACE

1. General

a. The maintenance allocation portion of the Technical Manual assigns maintenance functions and repair operations to be performed by the lowest appropriate maintenance echelon.

b. The lists in Section II are presented in columns titled as follows:

(1) PART OR COMPONENT. Only the nomenclature or standard item name is annotated in this column. Additional descriptive data is included only where clarification is necessary to identify the part. Components and parts comprising a major end item are listed alphabetically. Assemblies and sub-assemblies are in alphabetical sequence with their components listed alphabetically immediately below the assembly listing.

(2) RELATED OPERATION. This column indicates the various maintenance functions allocated to the echelon capable of performing the operation. These are defined as follows:

(a) Service. To clean, to preserve, and to replenish fuel and lubricate.

(b) Adjust. To regulate periodically to prevent malfunction.

(c) Inspect To verify serviceability and to detect incipient electrical or mechanical failure by scrutiny.

(d) Test. To verify serviceability and to detect incipient electrical or mechanical failure by use of special equipment such as gages, meters, etc.

(e) Replace. To substitute serviceable assemblies, sub-assemblies, and parts for unserviceable components.

(f) Repair. To restore to a serviceable condition by replacing unserviceable parts or by any other action required utilizing tools, equipment and skills available, to include welding, grinding, riveting, straightening, adjusting, etc.

(g) Align. To adjust two or more components of an electrical system so that their functions are properly synchronized.

(h) Calibrate. To determine, check, or rectify the graduation of an instrument, weapon, or weapons system, or components of a weapons system.

(i) Rebuild. To restore to a condition comparable to new by disassembling the item to determine the condition of each of its component parts and reassembling it using serviceable, rebuilt, or new assemblies, sub-assemblies, and parts.

(3) ECHELON ALLOCATED THE MAINTENANCE OPERATION. The symbol "X" placed in the appropriate column indicates the echelon responsible for performing that particular maintenance operation, but does not necessarily indicate that repair parts will be stocked at that level. Echelons higher than the echelon marked by "X" are authorized to perform the indicated operation.

(4) REPAIR FACILITIES CODE. Code numbers are assigned to each individual tool equipment, test equipment and maintenance equipment referenced under "Inclosure To The Maintenance Allocation Chart". The grouping of codes in the Repair Facilities Code Column of the Maintenance Allocation Chart indicate the tool, test and maintenance equipment required to perform the maintenance operation.

(5) REMARKS. Entries in this column will be utilized when necessary to clarify any of the data cited in the preceeding columns.

(6) INCLOSURE TO THE MAINTENANCE ALLOCATION CHART.

(a) FACILITIES REQUIRED FOR MAINTENANCE OPERATIONS. Tools, test and maintenance equipment required to perform the maintenance functions are listed in this column and coded in the Repair Facilities Code column.

(b) ECHELON ALLOCATED THE FACILITY. The symbol "†" placed in the appropriate columns indicates the echelons allocated the facility.

2. Comments or Suggestions:

Any comments concerning omissions and discrepancies in this appendix will be prepared on DA Form 2028 in accordance with Department of the Army Circular 310-16 and forwarded directly to Commanding Officer, U. S. Army Signal Equipment Support Agency, Fort Monmouth, New Jersey, Attn: SIGFM/ES-ML.

APPENDIX II

MAINTENANCE ALLOCATION CHART, PART II, SECTION II

PART OR COMPONENT	RELATED OPERATION	ECHELON ALLOCATED THE MAINTENANCE OPERATION						REPAIR FACILITIES CODE	
		OPERATOR	ORGANIZATIONAL		FIELD		DEPOT		
		FIRST ECHELON	SECOND ECHELON TACTICAL	SECOND ECHELON FIXED	THIRD ECHELON	FOURTH ECHELON	FIFTH ECHELON		
TEST SET, RADIO AN/URM-94	test					X		2,5	
ADAPTERS	replace					X		10	
	service	X						9	
ALIGNMENT TOOLS	replace					X			
ANTENNA	replace		X					9	
	inspect	X							
BAG, CARRYING (to carry complete AN/URM-94)	replace		X						
	service	X						9	
BOOK, INSTRUCTION	replace	X							
BUMPERS, RUBBER (test set base)	replace		X					9	
	inspect	X							
BUSHING, SLEEVE	replace		X					9	
BUSHING, STRAIN RELIEF, CABLE	replace		X					9	
CABLE ASSEMBLIES	repair					X		10	
	inspect	X							
	test					X		4	
CABLE, ELECTRICAL (cable assemblies and test leads	replace					X		10	
	inspect	X							
	test					X		4	
CAP, ELECTRICAL (fuseholder)	replace		X					9	
	inspect	X							
CAPACITORS, FIXED	replace					X		10	
	inspect			X					
CAPACITOR, VARIABLE	replace					X		10	
	inspect			X					
CASE, TEST SET (less boxes)	replace					X		10	Fabricate if required
	inspect	X							
CATCH, LUGGAGE (test set cover)	replace		X					9	
CLAMP, LOOP (cable clamp)	replace		X					9	
CLIPS, ELECTRICAL	replace		X					9	
CLIP, SPRING TENSION (retains antenna in case cover)	replace		X					9	
COIL, RADIO FREQUENCY	replace					X		10	
COLLET, CABLE (retains test prod cable)	replace					X		10	
CONNECTORS, PLUG, ELECTRICAL (cable assemblies and test leads	replace					X		10	
	inspect	X							

APPENDIX II
MAINTENANCE ALLOCATION CHART, PART III, SECTION II

PART OR COMPONENT	RELATED OPERATION	ECHELON ALLOCATED THE MAINTENANCE OPERATION						REPAIR FACILITIES CODE	
		OPERATOR	ORGANIZATIONAL		FIELD		DEPOT		
		FIRST ECHELON	SECOND ECHELON TACTICAL	SECOND ECHELON FIXED	THIRD ECHELON	FOURTH ECHELON	FIFTH ECHELON		
AN/URM-94 (continued)									
CONNECTORS, RECEPTACLE, ELECTRICAL	replace					X		10	
	inspect	X							
COVER, TEST SET CASE	repair		X					9	
	inspect	X							
ELECTRON TUBES	replace		X					9	
	test				X			7,8	
FUSE, CARTRIDGE	replace		X						
	inspect	X							
FUSEHOLDER	replace				X			10	
	inspect				X			10	
GASKET (test set case)	replace		X					9	
HANDLE, BAIL (test set case)	replace					X			Fabricate if required
KNOBS	replace		X					9	
	inspect	X							
LEADS, TEST (voltage and grounding test leads)	repair					X		10	
	inspect	X							
LEAD, TEST (E-12)	replace				X			10	
	inspect	X							
MOUNTING HOLDER (accomodates Crystal CR-3)	replace					X		10	
	inspect				X			10	
MULTIMETER, REPLACEMENT	replace					X		10	
	repair					X		10	
	service	X						9	
PACKING, PREFORMED (seal for screw)	replace					X		10	Fabricate if required
PLUG, TIP	replace				X			10	
	inspect	X							
POST, SWITCH (engages Switch S3 when test case cover is closed)	replace					X		10	Fabricate if required

APPENDIX II

MAINTENANCE ALLOCATION CHART, PART III, SECTION II

PART OR COMPONENT	RELATED OPERATION	ECHELON ALLOCATED THE MAINTENANCE OPERATION						REPAIR FACILITIES CODE	
		OPERATOR	ORGANIZATIONAL		FIELD		DEPOT		
		FIRST ECHELON	SECOND ECHELON TACTICAL	SECOND ECHELON FIXED	THIRD ECHELON	FOURTH ECHELON	FIFTH ECHELON		
AN/URM-94 (continued)									
PROD, TEST	replace inspect	X			X			10	
RESISTORS, FIXED	replace					X		10	
RESISTOR, VARIABLE	replace					X		10	
SCREW, SHOULDER	replace		X					9	Available in Maintenance Equipment ME-9
SEMI-CONDUCTOR DEVICES (crystals)	replace test					X X		10 1,3,6	
SHIELD, ELECTRICAL CONDUCTOR (test prod shield)	replace					X		10	
SHIELDS, ELECTRON TUBE	replace		X					9	
SOCKETS, ELECTRON TUBE	replace					X		10	
STRIKE, CATCH (test set case)	replace					X		10	Fabricate if required
SWITCH, PUSH	replace					X		10	
SWITCH, ROTARY	replace					X		10	
SWITCH, TOGGLE	replace				X			10	
TERMINAL BOARDS	repair					X		10	Plastic sheet and terminals available in Maintenance Equipment ME-9
TRANSFORMER	replace					X		10	
WRENCH (for removing and replacing knobs)	replace		X						Available in Tool Equipment TE-41

APPENDIX II
INCLOSURE TO THE
MAINTENANCE ALLOCATION CHART, PART II, SECTION II

FACILITIES REQUIRED FOR MAINTENANCE OPERATIONS	ECHELON ALLOCATED THE FACILITY						REPAIR FACILITIES CODE	
	OPERATOR	ORGANIZATIONAL		FIELD		DEPOT		
	FIRST	SECOND ECHELON		THIRD	FOURTH	FIFTH		
	ECHELON	TACTICAL	FIXED	ECHELON	ECHELON	ECHELON		
AN/URM-94 (continued)								
DECADE RESISTOR					†		1	
SIGNAL GENERATOR TS-497/URR					†		2	
METER TEST SET TS-682/GSM-1					†		3	
MULTIMETER ME-77/U			†				4	
POWER SUPPLY PP-1243/U					†		5	
TEST METER TS-169/FSM-1					†		6	
TEST SET ELECTRON TUBE TV-2/U						†	7	
TEST SET ELECTRON TUBE TV-7/U				†			8	
TOOL EQUIPMENT TE-41		†					9	
TOOL EQUIPMENT TK-21/G				†			10	

By Order of *Wilber M. Brucker*, Secretary of the Army:

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Div	Sig Fld Maint Shops	44–448
USATC	Sig Lab	55–28
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Br Svc Sch	Units organized under following TOE's:	
Gen Depots	10–377	
Sig Sec, Gen Depots	11–7	
Sig Depots		

NG: State AG; units—same as Active Army.
USAR: None.
For explanation of abbreviations used, see AR 320–50.

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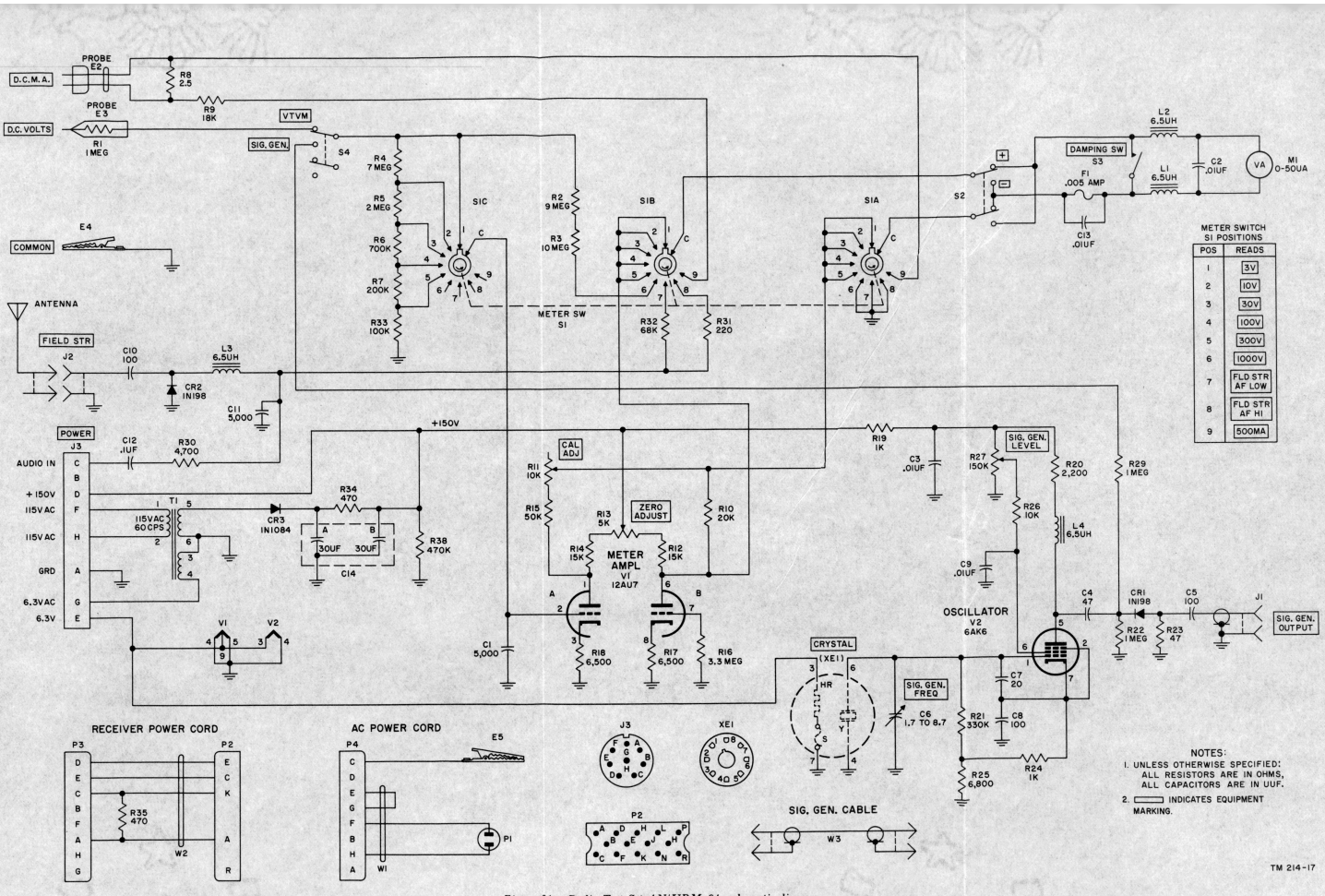

Figure 21. Radio Test Set AN/URM-94, schematic diagram.